

The Mining Journal

LONDON, MARCH 27, 1959

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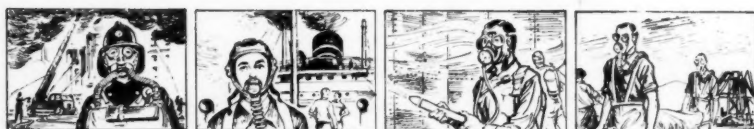
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Copper on the Jump

IT is a long time since the copper market was in such a jittery state. There are a lot of interests playing their hands cunningly close to their chests yet fearing all the time that they, too, may be taken for a ride. When the American custom smelters desert the market, as they did a week or so ago, and then come quietly back at 2 c. a lb. more and get away with it, it must be very trying for the fainthearted. Where in fact is copper going?

Sorting out the long-term from the short-term influences is simple enough. Taking supply and demand as they ought to be in the next few months, there should be plenty of copper for all those who want to buy it at rather less than they are paying now. There are, of course, signs that the recession is giving ground on both sides of the Atlantic. But this is a slow process. It must take time before Mr. Macleod's jubilantly announced reduction in unemployment translates itself into a more vigorous demand in Whittington Avenue.

We are now only weeks off the Budget and the surplus is undoubtedly there; the only question is how it is going to be handed out. This will cause some improvement in trade no doubt, but it may well be offset for a while by the uncertainties of a General Election. In any case, as far as British domestic consumption of copper goes, the electrical goods industry (an important consumer) has already had its boom in the last month or two; it is doubtful if the Budget will give it much more of a fillip.

Across the Atlantic things are improving—but slowly. There is no sign of a recovery that of itself would carry copper prices to significantly higher levels.

Taking a slightly longer view, demand might be very much stronger in nine months or so. Not only is industry being stimulated on both sides of the Atlantic but slowly and surely commodity prices are beginning to pick up and with them the purchasing power of many primary producing countries. Rubber, for example, is looking more hopeful now than for many months past; many of the foodstuffs are over the worst, and the Wheat Agreement has again been thought worth Britain's while. But even taking the view as long as one dare, demand could perhaps do little more than sustain copper at its present level; there would be no ground for any sharp rise.

What is causing the flurry in the markets is the strong prospect that supplies may be badly interrupted by strikes in a number of the producing countries. True, there have been plenty of strikes these past few months. But the situation now is that the big producers—and this is particularly true of the American firms—have rid themselves of the heavy stocks they were carrying a year ago. Their capacity for producing to meet any foreseeable demand is undoubted; but their stocks will not see the markets through a serious stoppage.

The threats are three. Much the gravest is of a complete stoppage in the American mines. The three-year contract expires on June 30, and it is a long time since contracts were signed all round without strikes. The Mine Mill and Smelters' Union is already blowing a little preparatory hot air. Its president claims

that "the spirit and militance of our members this year is tremendous. We are not going to be denied". What the union expects to get it is keeping to itself, but it is said to want more than it got in 1956 and much in fringe benefits besides.

The second danger is that new contracts have also to be signed in Chile, and there too there may be trouble. Since there is always likely to be trouble in Chile this is a matter that is constantly being discounted.

Finally, there are the severely unsettled conditions in both Northern Rhodesia and the Congo and though these have so far taken the form of purely political demonstration, the dangers to the mining properties are not to be overlooked. In any case, the African employees on the railways are now demanding advancement and this too might interfere temporarily with the movement of supplies.

It is against contingencies like these that buyers are now driving up the market. But it is all going very cautiously and each advance has its modest shakeout and bout of profit-taking. For if the strikes do not materialize—and the Mine-Mill Union is said to be low in strike funds—buyers will have paid dear for their metal. Even if the strikes do occur, the metal may not have been bought so very cheaply, for much of it must be going into consumer stockpiles and the price advance might be contained if the metal users were well stocked when the troubles arise. Then finally, someone (a very good card player, this one) has had the word government stockpile mentioned in the Press; and there sure enough is 50,000 tons that might be released to holders of American defence contracts.

All this accounts for the fact that while in the U.S. the custom smelters and dealers are this week cashing in at up to 34 c. per lb. (last week dealers were asking 35 c. and more), the big producers are sticking to 31½ c. The consumers will pay a little more for a little extra; but as yet they have no intention of paying 34 c. or more for the lot.

All in all it would, however, be foolish not to regard copper as a good buy at the prices it has been fetching this week on the L.M.E.

For the record it should be pointed out that the London price—even taking account of duty, freight and insurance—is very little above the U.S. producers' price and is certainly well below the 34 c. level, so if there is any thought in consumer circles that prices have been hoisted unreasonably in the past fortnight or so, the blame can scarcely be placed at the door of the L.M.E.

It is especially necessary that we should be clear about such events as they occur at a time when there is again talk of a managed copper price. Much of this appears to be coming from the Common Market countries, where consumers apparently feel that they ought to be paying a common price for copper, but are, of course, unable to do so because of the multiplicity of bases on which they buy their copper. If they would all base their deals on the L.M.E. then at least they would only have to worry about whether they were all paying an equally dear or equally cheap price for the metal!

People who talk about a managed copper price are a little bit inclined to speak of it as a thing to be achieved in the future, and to overlook the fact that there has been quite a bit of rather successful managing of the copper price over the last year during which producers by resolute and surprisingly uniform cutbacks in production have successfully restored market stability without any of the paraphernalia of fixed price agreements.

Incidentally, few things are more likely to produce violent fluctuations in, or pressures on, free market prices than the announcement by producers, buffer stock managers or any other substantial operators of their in-

tention to deal at pre-determined prices. Witness what happened to tin this last winter when the buffer stock manager stopped supporting the price at £730, or what happened to copper two years ago when the U.S. producers were finally induced to sell their Chilean output at L.M.E. prices.

RISING JAPANESE COAL STOCKS

A surplus of nearly 12,000,000 tons of coal is expected to weaken strike action this spring by the Japanese Mine-workers' Union against the Japanese coal producers and may bring to a head, in favour of the owners, a long-delayed action between the unions and the Bit Mitsui group in Japan.

Now reinforced to become one of the equals among Japan's giant financial combines, the reconstituted Mitsui Co. owns many coal mines which for some time have been producing below capacity. Low production is partly attributed to strong union action for better conditions, also to running into low seams and bad technical conditions.

With working costs increasing, and with high-grade coking coal becoming available in increasing quantities from Australia and New Zealand, Mitsui is reported ready this year to close down more than 15 per cent of its capacity and pay off more than 3,000 miners. Although industrial unrest is not confined to mining, among the various industries affected, coal mine owners are taking the stiffest attitude towards the unions by declining any increase in wages at all.

An unusually mild winter with plenty of rainfall increased hydro-electric power generation in Japan sharply. Power plants are now declining to take coal deliveries simply because their stocks have exceeded their storage capacity.

Leading coal mines are reported to be planning a joint company to "freeze" 1,000,000 tons of unsold stocks and to buy up obsolete mines to knock out 4,000,000 tons of annual capacity. They are also seeking export outlets in South-East Asia.

MEXICO'S NEED FOR A MINERALS SURVEY

While there has been a tendency towards increased mining production in Mexico in the past few years, according to a Bank of Mexico survey quoted by our correspondent in that country, this has "no great significance in the national economy". A comparison of mining income figures with gross national income shows constant fluctuation, with a tendency towards lower figures.

While the Bank stated that mining originally was the basis of the nation's economy, current increases in agricultural, industrial, and other fundamental activities, have left mining far behind. A series of studies undertaken by the Bank clearly indicate that Mexican exploitation of ores is not adequate, and so does not produce sufficient income. The entire mining structure cannot keep pace with Mexico's economic advances.

The current industrial development of the country, accelerating markedly within the past decade and a half, has created a number of problems for the mining industry. Chief among these are two major problems: first, the need to develop a programme of rational exploitation of mining riches; and second, an effective co-ordination in production of ferrous and non-ferrous metals with a rational pro-

gramme of slow industrialization of these in the production of diversified products.

In order to resolve the first problem, the Bank of Mexico's technicians recommend that an inventory of Mexico's mining resources, prepared on a highly technical and scientific basis, is absolutely "indispensable". For example, there is no true knowledge of the country's mineral wealth with respect to the less common metals, non-metallic minerals, and fissionable minerals. In so far as the second problem is concerned, the Bank states that there is an urgent need to industrialize Mexico's mining production within the borders of the Republic. It points out that studies are being made to lead to the construction of plants for zinc refining, the concentration of low-grade phosphorus products, tin smelting, and foundries to boost steel ingot production, as well as other processing plants for lead, copper, etc.

According to an exhaustive field survey concluded by the Bank, although this admittedly does not plumb the full depth of Mexico's reserves, the Republic has "abundant" deposits of zinc, silver, lead, gold, and copper. Minerals of comparatively recent exploitation include manganese, sulphur, fluorite, and barytes. While full appraisals of deposits of these minerals do not exist, it is expected that manganese deposits will soon be subjected to appraisal based on recent discoveries. The Bank stated that proved deposits so far run somewhere in excess of 7,240,000 tons. Sulphur deposits on the Isthmus of Tehuantepec are estimated at more than 45,000,000 tons. Minerals, the production of which is insufficient for the country's internal needs, include tin, aluminium, potassium, talcum, phosphate, asbestos, and non-metallic minerals in general.

Basic materials for Mexico's heavy industries, iron and steel, have still to be officially estimated. While deposits exist in vast areas of the country, there has been no formal attempt at estimating total reserves, although unofficial figures, often conflicting, are released from time to time. The Bank of Mexico has instituted investigations, and subsequently more formal estimates will be available.

The Bank says in its report that exploration of deposits having "the greatest possibilities" will soon be undertaken. For example, it is believed unofficially that the Coahuila and Sonora basins alone have over 450,000,000 tons of iron and coal. Mexico's reserves, without a breakdown, of coal and iron are unofficially estimated by the Bank at more than 250,000,000 tons, and possibly up to 3 billion tons. But an accurate figure is not as yet known.

The same may be said of the misty picture concerning deposits of radioactive materials. Mining engineer Guillermo P. Salas, head of the Institute of Geology of the National University of Mexico, said recently that "practically half of national territory has conditions favourable for containing fusionable minerals". Sr. Salas said that Mexico should actively begin intensified exploration and exploitation (little is going on at the moment) so that the Republic can begin utilizing radioactive mineral reserves to generate industrial energy within the next decade. To do this, however, a much greater acceleration of exploration will be necessary. The current administration is moving towards this, but detailed studies of geological structures as an aid to selecting areas with best prospects are still at discussion stages. The entire programme is held up by the fact that Mexico claims all radioactive minerals as property of the State, and this gives little incentive to private exploration. Sr. Salas has said that perhaps work could be speeded up by giving incentive to mining interests so that discoveries can be made without cost to the State.

In general, however, with the lack of accurate official statistics on deposits of even such heavily produced metals as silver, copper, etc., the Mexican mining industry finds itself seriously hampered. Lack of venture capital for

industrialization of metals and minerals is another headache. On top of all this, burdensome taxation, despite certain subsidy concessions given by the government, places Mexico's mining industry in a position where it has been, and is, static.

Our correspondent also reports that medium and small mining operations there have petitioned the Treasury Department to provide fiscal facilities for the exportation of 150,000 tons of lead and zinc to European nations.

The Association of Small Mining Firms said that a reduction, or total abolition, of export taxes for the two metals would "alleviate in part the difficulties experienced by the local industry, which for months, since the imposition of new quotas by the United States, has been in a state of crisis". Continued low prices have also been an adverse factor, the Association said. However, it is noted that European industrialists are continuing to order new shipments of lead and zinc, and the Association believes that this trend will continue to grow.

Until now, the Treasury has only authorized shipment of 5,000 tons of both metals to Europe. The Association believes that now is the time to take advantage of European demand and cut away as much as possible from dependence on the United States market. Treasury officials are studying the request, which first must be approved by the Department of National Economy. However, it does not appear as though any impediment will be placed in the way of a greater flow of Mexican lead and zinc to Europe.

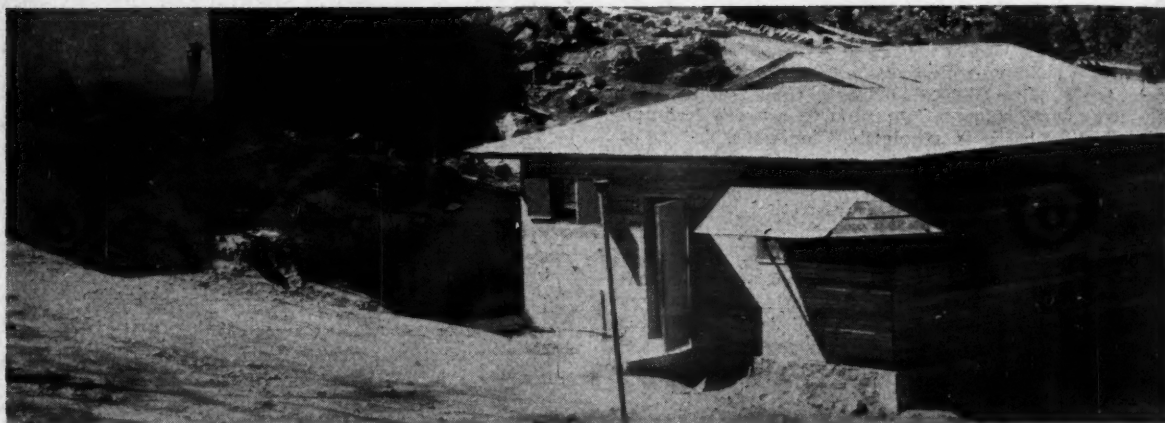
According to the Federation of Mining Associations, the restrictive quota policy of the United States has led to the closure of more than one hundred mines in Chihuahua and Zacatecas in recent months and to the unemployment of at least 20,000 miners.

PRACTICAL POLITICS IN THE FEDERATION

One of the most attractive of booklets circulating among mining firms just now is one from R.S.T. describing the Kafue Flats scheme and carrying on its front cover a highly-coloured picture of the cutting of the first wheat crop with a combine harvester. The objects of the scheme have been widely discussed for some years past, but there is something distinctly encouraging about the pictures of the actual experimental polders with their irrigation canals, of the standing wheat and of the gang of one white, and three black, Africans working the tractor and harvester.

It is especially encouraging to have this booklet at the present time. Whatever political difficulties now afflict the Federation, the fact is that there is a lot of solid achievement in the way of racial partnership in the Copperbelt and more is promised in the Kafue Flats scheme. Apart from the value to the Federal economy in the production of new wealth, if the scheme is fully realized, one out of every 34 African families in Northern Rhodesia could get a good living on the Flats — with 20 acres, a house, a little machinery and the prospect of a better diet and a higher income than ever before.

It will, of course, take time. Ten years of experiment to test the possibilities and discover the likeliest strains of crops and cattle are thought to be necessary, but so far as they have gone, the tests are understood to be most encouraging. And it will take money—at £200 an acre, a total of £90,000,000. But as the booklet says, "the cost of developing the Kafue Flats could be very high indeed. Few who concern themselves with the future wellbeing of the Rhodesias and Nyasaland will dispute that the cost of doing nothing may well be very much higher". If partnership is eventually realized in the Federation it will indeed owe much to the efforts of the copper companies.



The Consolidated Halliwell mine office at Meme

British-Canadian Alliance Exploits Haiti Copper

By Claude H. Taylor



IN mid-March, British and Canadian machinery mining interests joined an alliance to gear copper deposits in the Republic of Haiti for production. Denver Equipment Co. Ltd., London, and Consolidated Mogul Mines Ltd., a Toronto based holding-financing company, signed a \$2,200,000 contract to equip Consolidated Halliwell Ltd. with a 1,500-ton daily capacity copper flotation plant in Haiti. This is not the first instance of British-Canadian participation in the copper field. Denver Equipment arranged a somewhat similar agreement with Consolidated Mogul Mines to assist in bringing its St. Patrick's Copper mine, near Dublin, Ireland, to production late last year.

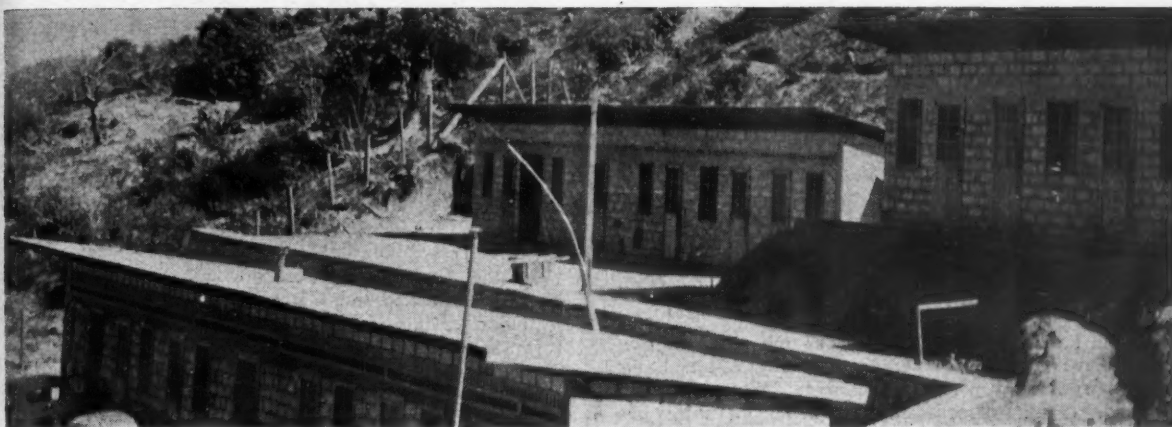
This British-Canadian alliance is twofold. British manufactured mining equipment is channelling into new fields throughout the world. And Canadian mining "know-how" is proving the ore deposits to make this arrangement so satisfactory to both parties. Under the contract, signed by two British directors of Denver and by officials of Consolidated Mogul and Consolidated Halliwell, Denver undertakes to erect all necessary buildings, provide and install machinery and equipment, and supervise start of production, expected prior to the summer of 1960. Consolidated Halliwell holds title to a 100 square mile mining concession, through its Haitian subsidiary, Sedren, S.A., in the north-western portion of the Republic of Haiti. Actually the district is known as Terre-Neuve, being 160 miles north of the capital, Port-au-Prince, and 13 miles from tidewater at Gonaives. The latter is the site of the dock construction where machinery and equipment will be unloaded from England about two to three months hence.

Mine development is well advanced for production.

Consolidated Halliwell and its Haitian subsidiary completed an aeromagnetic survey over the entire concession area. Topographic maps, on a scale of 1,000 ft. equals 1 in., have been compiled for the concession area and for selected areas, such as the ore enriched Meme and Casseus sectors, where much development has been accomplished. A total of 80,979 ft. of diamond drilling was completed on surface at the Meme, Casseus, and Bresillac showings, including 11,290 ft. of underground drilling in the main Meme workings.

Many additional surface discoveries were made, since securing the concession, over and above the Meme, Casseus, and Bresillac. Exploration was discontinued in June, 1957, but field parties again resumed exploration in

Haitians moving ore from adit to surface stockpile



Motel-type living quarters for miners and drillers. Mine development is well advanced for production

late 1958, and just recently a very promising discovery of widespread secondary mineralization was located in the extreme north-westerly limits of the concession. Attention will be directed to this showing at a later date.

The principal effort has been directed to the Meme deposit, by drilling and adit development. Two distinct types of mineralization have been explored. These are the surface secondary oxide and the underground primary sulphide types. The surface oxide type mineralization has been explored to a lesser degree since the method of treatment involves a long-term objective. These occurrences consist of rich pockets of erratic distribution which are easily accessible and appear limited in tonnage. The copper-bearing minerals are entirely oxides and carbonates, principally malachite and azurite.

The primary ore occurs entirely beneath the surface. This ore is almost entirely chalcocite and bornite in nearly equal proportions, with minor chalcocite in local instances. The principal gangue minerals are epidote, garnet, calcite, magnetite, chlorite, and quartz.

Precious metals show a wide variation in both occurrences. Gold may be present in the rich oxide occurrences in quantities up to 1 oz. per ton, but generally average 0.08 oz. per ton. Silver content likewise may reach as high as 10 oz. per ton, but the average content in the oxide ore is slightly over 1 oz. per ton.

In the same vein, the occasional erratic gold assay up to 0.4 oz. per ton occurs in the primary ore. The average content of gold and silver in the sulphide ore is 0.04 to 0.05 oz. per ton Au and 0.7 to 0.9 oz. per ton Ag. Pyrite and allied barren sulphides are of minor importance. Only in one instance, on the 1,150 ft. level, has an appreciable amount occurred in the ore zone.

Extensive surface drilling and underground development, adopting a realistic price of approximately 30 c. per lb. for copper, have placed ore reserves, after dilution, at 4,031,400 tons averaging 1.88 per cent copper. Reserves are calculated as:

Location	Character	Tons	Cu
Meme No. 2 Zone (Measured Reserve)	Primary and proven Probable and drill indicated	2,230,000	2.34%
Meme No. 1 Zone	Partially oxidized and drill indicated	514,000	1.16%
Casseus	Drill indicated	311,400	1.56%
		976,000	1.31%
	TOTAL	4,031,400	1.88%

Fairly extensive metallurgical tests have been completed on the ore, a flowsheet has been devised, and Denver Equipment is proceeding on a turn-key programme for the construction of the concentrator and ancillary plant. Crushing capacity will be 2,000 tons daily, permitting raising of concentrator capacity from 1,500 tons to 2,000 tons, on a minimum expenditure at a later date.

Metallurgical investigation has found the ore material relatively soft and easy to grind. Concentration is simple, since the recovered metallic fraction is entirely chalcocite and bornite without additional metallic disturbing influences. Concentration exceeding 90 per cent, and probably of the order of 95 per cent, will result in a merchantable concentrate containing between 30 per cent and 40 per cent copper. These investigations have established that equipment requirements will be modest with simple flotation of the copper-bearing sulphides the prime object.

Underground development was commenced in August, 1956, when the No. 1 adit (1,500 level) started opening the Meme No. 2 ore zone. This was followed by the No. 2 adit (1,130 level) and the No. 3 adit (1,150 level). A three-compartment shaft was started on the 1,500 level to provide access for mining the ore below that horizon. To December 31, 1958, underground accomplishment included 2,270.5 ft. of adits, 2,128.4 ft. of drifts, 783.7 ft. of crosscuts, 680.7 ft. of raises, 96 ft. of shaft raising and 30 ft. of shaft sinking.

Consolidated Halliwell's exploitation of its copper holdings in the Republic of Haiti is being accomplished with a minimum of foreign workers, merely using from five to ten Canadians in the programme. During 1958, the number of Haitians employed varied from 105 to 215. However, the payroll is now being stepped up by utilizing both Canadian and Haitian labour force. Requirement of this year's construction and mine development projects should run to some 450 employees monthly.

Financing of the Consolidated Halliwell project to production is being accomplished by the Denver-Consolidated Mogul alliance, by recent firm commitments on Consolidated Halliwell stock, and by the guaranteed purchase of Consolidated Halliwell debentures by Consolidated Mogul. Currently, Consolidated Mogul directs the management policy of North Rankin Nickel Mines, Canada's most northerly nickel-copper producer operating in the permafrost of the Hudson Bay region, and St. Patrick's Copper Mines, Western Europe's largest non-ferrous metal producer.

The Swedish Mining Industry in 1958

By John Hedlund

THE decreased demand for iron ore on both the export and home market, which has caused postponed delivery times and diminished interest in low-valued ore, has contributed to a decrease of the iron ore output during 1958 compared to 1957. In 1958, the iron ore production amounted to about 18,600,000 tonnes, and in 1957 to about 20,000,000 tonnes. During 1958, 17,800,000 tonnes was exported compared to about 17,500,000 tonnes in 1957.

Within the sulphide ore group, sales difficulties for iron pyrites have in certain cases entailed a change of operations to ores with richer percentage of metals that are still in demand. In spite of occasional low metal prices, this has made it possible to go on with extraction almost to the same extent.

The strained economic situation has in some cases affected the pace of ore prospecting and delayed the start of new building projects. Extensions and rationalizations already started have, however, been carried through according to plan. An increased interest has been displayed in transition to concentrate production of low-valued iron ores.

In 1958, one mining right was granted for one company for uranium. Twenty-four companies and individuals were granted sixty-six exploration rights. In spring, 1959, proposals for a new uranium law were under consideration by the Riksdag.

During 1958, at Luossavaara-Kiirunavaara AB's iron ore mine at Kiruna, about 50 per cent, or about 5,000,000 tonnes, were produced from increasing underground mining. At the Central plant, the sinking of the shaft and driving of headings, as well as machine installation, have been carried through. A twelve-storey office is being built and the building of the compressor plant completed.

At the company's mine at Malmberget, where 3,300,000 tonnes of iron ore were produced during the year, of which 120,000 tonnes have been concentrate and 130,000 tonnes pellets, preparatory work and shaft sinking have continued in three of the four planned shaft groups. Two shaft towers about 65 metres high have been built. Construction work for the new dressing plant has continued and installation of machines has started. Two screw com-

pressors of Atlas Copco's new type, each on 450 cu. m./min., have been installed. The extension of the sinter plant for an annual output of 350,000 tonnes has started.

At the Grangesberg iron ore mines of Trafik AB Grangesberg-Oxelösund, a transition from sub-level caving to block caving is going on where circumstances are favourable, and the use of shuttle dumpers in the sub-level caving is being increased. During the year, plans have been formed to get better results in the sorting and dressing plants through reorganization, mechanization, and rationalization.

At the Strassa mine, where machine installation is going on in the sorting and dressing plants, the production of iron ore concentrate is calculated to reach full capacity—430,000 tonnes—at the end of 1959. The preparations have proceeded according to plan. In 1959, the building of the new sinter plant for an annual output of 150,000 tonnes of pellets is to be started.

At the plants of Stora Kopparbergs Bergslags AB, at Grangesberg, the new dressing plant, which is to produce 300,000 tonnes of iron ore concentrate yearly, is now being completed.

After grinding in rod mills to minus 3 mm. and separating of magnetite in magnetic separators, the remainder of the ore containing haematite is carried to two banks of Humphreys spirals. Each bank has eighty spirals, the first being of the five-turn type which gives pre-concentrate. The second bank consists of three turn spirals, and this gives the final product and a middlings product which is subsequently returned to the first bank. This plant is probably the first in Europe to produce prepared iron ore concentrate with the help of Humphrey spirals. At the company's iron ore mine at Blotberget, surface quarrying

Flood lighting on the slopes and terraces of Kiirunavaara. In the foreground are the Luossavaara sorting plant, Lake Luossajarvi and the railway



will be finished in 1959. Underground mining will be carried out by the sub-level method.

At the Stallbergbolagen's mine, at Stallberg, the switch-over from shrinkage stoping to sub-level benching has turned out well. The company's test plant at the Uto mine in the archipelago of Stockholm was completed, and this activity discontinued.

Investigation of iron ores has given encouraging results. In the company's iron ore mine at Forsbo, Dalecarlia, the shaft has been sunk to a depth of 250 metres, and the ore was found to continue over an unchanged area at 200 metres depth.

At Haksberg, near Ludvika, owned by AB Statsgruvor, the newly built dressing plant for magnetic, gravity, and flotation concentration of iron ore was started and reached the normal rate of production. The operation corresponds on the whole to the capacity and quality calculations.

Norbergs Grufforvaltnings new sorting plant for iron ore at Balsjon, Norberg, is being started up. The new blind shaft at the central plant for crushing has been sunk from 250 to 350 metres depth. Loading of rock was carried through by scoop and direct hoisting.

The ore at Bispberg, owned by Bispberg AB, located by aerial and surface prospecting, has been proved over an area of about 5,000 square metres at 470 metres depth. The ore, which mainly contains magnetite and has about

10 per cent haematite, was found for a further 200 metres. The deposit has a minimum depth of 390 metres and has been prepared for mining from 470 metres. The discovery is unique in the respect that it probably is the first ore that has been found at such a depth by aerial prospecting.

In the lead ore mine at Laisvall, in the west part of the Skelleftea area, Bolidens Gruv AB has increased its hoisting during 1958 to 600,000 tonnes, and the haulage is expected to increase during 1959 to 700,000 tonnes. In the company's sulphide ore mine at Kristineberg and Langsele, the mining operations have been concentrated on ores suited to the present situation.

At the copper prospect at the Brannmyr mine, the shaft has been sunk to 260 metres. Due, *inter alia*, to the fact that the shaft is circular, and to the use of standard components at the shaft building, the rate of sinking has amounted to 1.5 to 2 metres in 24 hours.

At the company's lead ore mine at Idre, Dalecarlia, a headgear with iron ore magazines is being built. The whole plant is expected to be ready within a year.

At the Svardsjo sulphide ore mine, a new headgear and ancillary surface buildings are being built. It is estimated to yield 60,000 tonnes of crude ore yearly. The ore contains zinc, lead, and copper with silver.

The Ville Montagne Co.'s mine in the county of Narke has been prospected to a depth of 500 metres.

The Monorail Principle in Mining

THE principle of the monorail slide has been applied at the Premier Mine, South Africa, to carry equipment weighing up to 1,000 lb. between various working levels at the mine, according to a report in *Optima*, a quarterly review published by the Anglo American Corporation of South Africa.

Communications between certain mining levels that are not directly connected to a shaft is through inclines 8 ft. wide and 7 ft. high; they are between 300 and 400 ft. long, and they dip at angles between 32 and 45 deg. Men moving from one level to another use concrete stepways in these inclines. Before the introduction of the monorail, material and equipment were moved through an incline in a steel-plated skid car, 15 ft. long, running on a permanent skidway. The skidway consisted of an 18-in. gauge track (using 45-lb. rails) concreted in at the side of the steps. The skid car was operated by a 25 h.p. electric single-drum winch situated, with all the accessories, at the top of the incline.

This somewhat elaborate arrangement has been greatly simplified by the introduction of the monorail system. Instead of the heavy, steel-plated skid car, a light carrier, made of welded mild steel plate, is used. The carrier is

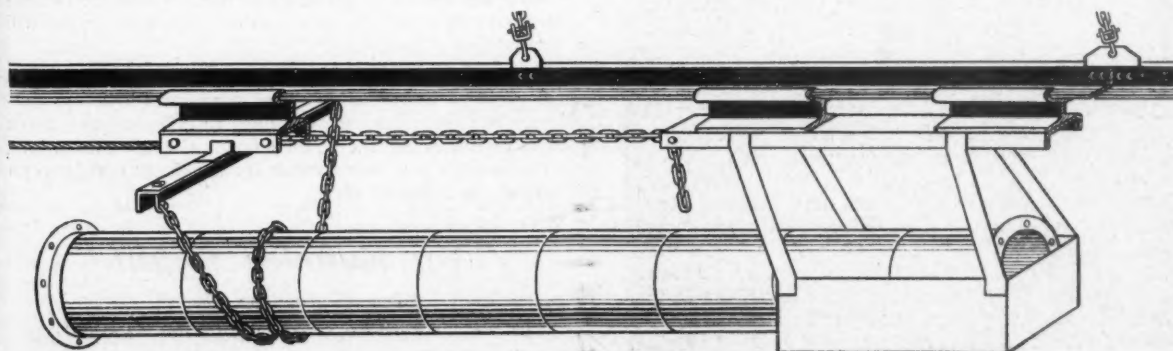
suspended from a single rail attached to the hanging wall of the incline.

The rail consists of angle irons (measuring 3 in. by 3 in. by $\frac{1}{2}$ in. thick) in lengths of 30 ft. laid back to back and bolted together at intervals of 7 ft. 6 in. by means of hanging plates. Palm bolts ($1\frac{1}{2}$ in.) are wedged into the hanging wall above these plates; chain, between 1 ft. and 2 ft. long to suit the variations in the hanging wall, is attached to each bolt. Hook bolts screwed into supporting forks, which are bolted to the hanger plates, provide a means of aligning the rail in the vertical plane.

The carrier is suspended from two sliding stoppers by flat iron hangers inclined at 30 deg. to prevent a bending movement. An auxiliary stopper, about 12 ft. ahead of the carrier, is attached to the carrier by a length of chain to enable long material to be transported, as shown in the diagram.

The monorail carrier is operated by a 10 h.p. winch at the top of the incline, and moves at a speed of 200 ft. a minute. The maximum load is 1,000 lb., allowing for a safety factor of four.

This system is ideal for use in "light duty" inclines.



THE MINERAL WEALTH OF GUINEA—IV.

Exploiting Guinea's Aluminium Potential

TO exploit the bauxite deposits of Guinea and bring into being a project of such a scope, Aluminium Laboratories are reported to have reached a tentative agreement with Pechiney-Ugine, acting both in their own name and as trustees for A.F.R.A.L.

This undertaking—participants of which include, *inter alia*, Italy's Montecatini, Germany's Vereinigte Aluminium Werke, and Switzerland's Société Anonyme Suisse pour l'Industrie de l'Aluminium has been especially set up to develop on a West European co-operative basis quite a few similar projects over the franc area in Africa, mainly in the Sahara.

The Dabola Deposit

These central Guinean deposits, discovered in 1943 by the Pechiney geologists, may well prove the biggest in the whole of Africa. They are sited on 3,500 ft. high "bowés" overlooking by some 1,800 ft. the town of Dabola and the upper reaches of the Tinkiso, Baffing, and Bouka tributaries of the Senegal river.

In the neighbourhood of Baro, this bridge spans the Naindan torrent. The 414-mile Conakry-Kankan railway is the main means of access into Guinea's hinterland. Yet the narrow gauge line cannot cope with greatly increased mineral ore traffic



Extensive drilling on the Oursa and Sinséri "bowés" a few miles to the north of Dabola, and to a lesser extent on other "bowés" situated 20 miles to its east and 30 miles to its west, has established the existence of tremendous bauxite deposits. A first estimation of their reserves runs to well over 100,000,000 tonnes. Originating from the alteration of dolerite lodes resting on a pre-Cambrian substratum, the ores have no silica to speak of, but here again their iron-oxide content may vary greatly.

Since they lie right in the heart of Guinea, well over 300 miles from the Atlantic seaboard, their development will cost a great sum. Although Dabola itself is located on the Conakry-Kankan railway, this narrow-gauge mountain line cannot possibly cope with at least 1,000,000 tonnes extra traffic per year. The cost of constructing a special road to evacuate the ore across difficult country will be prohibitive.

The answer will be to build a huge plant on the spot with a yearly capacity of anything up to 480,000 tonnes of aluminium. But its remoteness from the upper basin of the Konkouré torrent will prove a drawback. Detailed hydro-electric studies have established that this most likely source of power in Guinea is capable of generating 3,000,000,000 kWh. a year. This output will suffice to take care of the power requirements of both the Kindia and Dabola projects. Of course, it might prove feasible to harness the three tributaries of the Senegal river, nearer to hand, although they are far from offering the big potentialities of the Konkouré.

Waiting for the Dust to Settle

In both projects the decisive factor will be the price charged per kWh. to be negotiated with the country's government. This in turn depends on the construction costs of the Souapiti and Amaria dams.

As is invariably the story with all under-developed lands, the infra-structure costs heavily inflate the bill. The companies interested in the development of the country's tremendous mineral wealth understandably balk at building entirely at their own expense the special roads to the dams and plants, not to speak of harbours and even the inter-connecting grid. The provision of supplies and the recruitment of native workers in a sparsely populated region will also involve extra costs.

Protracted negotiations were under way with the French Government in regard to those extra infra-structure outlays. But the accession of Guinea to independence seems to have turned off the French financial tap. Meanwhile, these projects will have to wait for the dust to settle to go beyond the blueprint stage.

By Maurice Moyal

Editor of "Petroleum Mirror,"
the monthly newsletter of the French petroleum industry.

MINING MISCELLANY

At the invitation of the China Petroleum Corporation, Dr. Arnold Heim, a noted Swiss geologist, arrived in October in Formosa for a six-month stay to prospect the island's oil reserves.

M. Paul Delouvrier, the French Government's Delegate-General in Algeria, announced after a restricted cabinet meeting recently that details of the project for a giant steel undertaking at the Mediterranean port of Bone, announced by President De Gaulle in his Constantine Plan last year, had been approved. The undertaking, which would be completed in four years, would cost 100,000,000,000 frs., and would produce between 400,000 and 500,000 tons of steel a year from the nearby iron ore deposits.

The Taiwan Industrial Development Corporation's three-year \$NT20,000,000 plan for a sea-bottom mine off Keelung should be completed by the end of this month. Total coal deposits estimated at 10,000,000 tons are expected to yield 100,000 tons a year to add to Formosa's present annual output of 3,000,000 tons.

Russia is negotiating with a British firm to buy £1,000,000 automated plant for smelting copper and other fine ores. The West German newspaper, *Industrie Kurier*, mentioned this fact when quoting a recent statement in Moscow by Mr. Platonov, vice-president of the Soviet State Purchasing Co., Machino-import, that negotiations were going on with the London firm of Elliot Automation for the purchase of the plant.

A new Irish company, Irish Synthetic Ammonia Development Co. Ltd., has been registered for the purpose of processing copper pyrites from Avoca into sulphuric acid for use in the manufacture of superphosphate.

A team of geochemists from the Department of Geology and the Geochemical Research Centre, Royal School of Mines, Imperial College of Science and Technology, are conducting an investigation into the distribution of tin, niobium, rare earths, and radioactive minerals in the rocks of the Jos Plateau in Northern Nigeria. Dr. J. R. Butler and Mr. P. Bowden, of the Department of Mining Geology, arrived in Nigeria on February 5, and have been studying the geochemistry of the Younger Granite Complex. Dr. Butler has returned to London. Dr. A. Mather and Mr. D. Sampey, of the Geochemical Prospecting Research Centre, also arrived in Nigeria on February 5. After a short investigation at Liruei, they have been carrying out geochemical prospecting research on tin and columbite at the Amo and Sara-Fier Younger Granite Complexes in Plateau Province.

Official Russian figures issued from Moscow recently state that tin exports from the U.S.S.R. stood in 1957 at 18,011 tonnes, as against only 3,258 tonnes in 1956, and 2,067 tonnes in 1955. In 1955 and 1956, nearly all tin exports went to Eastern European countries, but by 1957 Western interest had grown sufficiently for Holland, the United Kingdom, West Germany, Switzerland, and France alone



In 1958, for the first time, uranium became Canada's leading metal mineral product. Almost half of Canada's 13,500 tons of uranium production in 1958 was mined and processed by the Rio Tinto Group. A window display at Ontario House illustrates the Group's activities in the Canadian uranium industry. The display constitutes two windows, one showing operations in the mining and treatment of uranium ores, and the other dedicated to the peaceful uses of nuclear energy

to import 6,767 tonnes from Russia, and figures for last year, as far as they are available, show that this interest has increased to a remarkable extent. In the months January to November, 1958, these same countries imported a total of 16,094 tonnes of Soviet tin. Soviet tin imports in long tons from China were 16,633 tons in 1955, 15,452 tons in 1956, and 21,653 tons in 1957.

Cetson Mining Corporation, a new Philippine copper firm, has announced the acquisition of fifty new mineral claims of copper and gold, located in Bondoc Peninsula, Quezon Province. The company has reported that geophysical studies had indicated the presence of "huge deposits of copper and gold capable of maintaining several big smelters". The total area held by Cetson could produce an estimated 2,000 tons of milling ore daily over a period of fifty years, the company added.

Testing of phosphate ores from the Negev, Israel, region has already been started by the foreign company participating in the projected phosphorus plant to be built in the Negev. The first stage of the projected plant will cost about £2,200,000 sterling, and would produce some 10,000 tons of elemental phosphorus. In the second stage, output would be doubled with a further investment of about £1,400,000 sterling.

The Broken Hill Proprietary Co. continues to expand its works at Newcastle and Port Kembla, New South Wales. A large expansion programme has been in progress at Port Kembla, including the erection of a new blast furnace ranking with the world's largest. New coke ovens are under construction. A second furnace, of equal size to that first brought into use, will be completed by February, 1961. The new furnaces and ancillary equipment will cost £6,500,000. Final capacity at Port Kembla No. 2 plant will be 1,250,000 tons of steel ingots per year, making the capacity of the Port Kembla steel works 2,550,000 tons per year.

The coal industry in South China made progress in 1958, according to statistics. Yunnan produced 9,000,000 tons, Kwangsi Chuang A.R. over 4,000,000 tons, and Kwangtung 2,800,000 tons.

Steel production in New South Wales for 1958 approximated 3,000,000 tons, thus the output at the end of the current year will be in excess of 4,000,000 tons. Another 1,000,000 tons will be added by 1961, which year should see progress with the steel-making plant at Whyalla. Heavier supplies of iron ore will be drawn from the Middleback ranges in South Australia, where reserves in the Iron Monarch and Iron Baron quarries will be supplemented by some 30,000,000 tons located by government drilling.

The Ministry of Economic Affairs for Formosa plans mineral exploration for deposits of oil, copper, iron, manganese, gold, silver, and pyrite.

The future of the aluminium project operated by the Commonwealth and Tasmanian State Governments at Bell Bay, Tasmania, is of interest. The Bell Bay works, using imported bauxite, has a capacity of 13,000 tons of aluminium ingots per year, but from the economic point of view increased production is essential. To provide the necessary capital, to reach a proposed objective of 26,000 tons of metal per year, the two government partners have considered taking private enterprise into the project and an investigation has been made by British interests, whose decision is awaited.

The coal output of Liaoning province, China, for 1958 was 38,000,000 tons, of which Fushun produced 14,000,000 tons and Fusin 13,000,000 tons.

A modern coal dressing plant is being constructed at Chuchow in eastern Hunan province of China. It was de-

signed with Polish assistance and is being supplied with Polish equipment. Another such plant is being constructed with Soviet aid at Hokang in Heilungkiang province. In the Kisi coal mines in Heilungkiang, eight simple coal dressing plants have been built in the past six months by workers, students, and government functionaries. The province is now trying to popularize such coal dressing plants.

Plans to reopen non-ferrous metal mines near Silverton, Colorado, owned by U.S. Smelting, Refining and Mining Co., have been announced. The properties have been leased to Marcy-Shenandoah Corporation of Durango, Colorado, for an undisclosed consideration. Standard Uranium Corporation announced it has purchased 50 per cent of the assets of Marcy-Shenandoah and has a 36-month option on the remaining 50 per cent.

Duval Sulphur and Potash Co. has begun removal and crushing of copper ore from its New Esperanza open pit mine in the Twin Buttes mining district, 25 miles south-west of Tucson, Arizona, United States. The mine is expected to reach capacity output of 12,000 tons of ore daily within two months.

A new type of fuel has been developed at the Yallourn brown coal mine by the Gas and Fuel Corporation of Victoria, Australia. The Corporation hopes the new fuel may displace the use of New South Wales coke in metallurgical work, and the fuel is described as a hard char, which is the brown coal equivalent of metallurgical coke, and is being produced in semi-commercial quantity at an output rate of 25 tons per day. The output could be increased to 600 tons per day.

The Matsuo Kogyo Kaisha, a local Tokyo mining company, has announced that it is considering proposals to launch a joint venture with the Useinhan Co., of Burma, which would develop antimony deposits near Moulmein, south-eastern Burma. The Japanese company has stated that it was discussing plans with the Japanese Government because it hoped to undertake the venture within the framework of the Japan-Burma Economic Co-operation Agreement, which formed part of the reparations agreement between the two countries. The company added that the plans were first put forward by the Mineral Resources Development Corporation of Burma. Japan now depends almost entirely on imports for its requirements of antimony, which are put at some 3,000 tons annually.

PERSONAL

Two new directors have been appointed by F. Perkins Ltd., the Peterborough diesel engine company. They are Mr. J. G. Dawson, director of engineering, and Mr. G. Smith, director of production.

Mr. A. Denarie has been appointed European sales manager of Gordon Felber (Asbestos) Ltd., of London.

Mr. R. G. Soothill has been appointed chairman of Turner and Newall in succession to the late Sir Walker Shepherd.

Mr. D. F. Haydon, chief technical sales representative of Baird and Tatlock

(London) Ltd., and Hopkin and Williams Ltd., left this week for a six-week tour in the Middle East. He will be visiting agents, representatives, and customers in the Persian Gulf, Iraq, Iran, and the Lebanon.

Mr. M. Simmons, manager of the Quality Control Department at the Goodyear Tyre and Rubber Co. (Great Britain) Ltd., Wolverhampton, has been awarded the Institution of Engineering Inspection Past President's Diploma for the 1957-58 session.

The International Tin Research Council has announced the appointment of Dr. Dudley A. Robins as chief metallurgist at the Tin Research Institute.

Mr. P. W. Underhill, who is chief shipping officer at Birlec Ltd., has been appointed the new chairman of the West Midlands branch of the Institute of Export.

Mr. R. D. Baird, B.A., E.R.D., has been appointed a director of Baird and Tatlock (London) Ltd., and of Hopkin and Williams Ltd.

Mr. R. B. Utt, vice-president and executive engineer, of the Western Machinery Co. of San Francisco, was elected third vice-president of the Manufacturers' Division of the National Sand and Gravel Association at its annual meeting recently in New Orleans.

A U.S. Operations Mission expert, Professor Fred Williams, has taken up a two-year position in the Mining Engineering Department of the Technion, Israel Institute of Technology, Haifa. Professor Williams will also advise the development company of Israel Mining Industries.

Dr. Pumphrey, manager of the Research Department of Murex Welding Processes Ltd., Waltham Cross, has been elected to the Court of Governors of the University of Birmingham, as a representative of the Guild of Graduates.

At a recent meeting of the Aluminium Industry Council, Mr. H. G. Herrington, C.B.E., managing director of High Duty Alloys Ltd., a member of the Hawker Siddeley Group, was elected as chairman of the Council for a third term of office.

Mr. N. J. Muschamp, a well-known Nottinghamshire industrialist, and founder, chairman, and managing director of N. J. Muschamp and Co. Ltd., mining engineers and mining equipment manufacturers, of Mansfield Woodhouse, has died at the age of 56.

Mr. J. S. Brough has joined Humphreys and Glasgow Ltd., of London, from Monsanto Chemicals Ltd. He will act as technical director and general manager, and deputy to Mr. G. G. Farthing, deputy chairman and managing director of Humphreys and Glasgow.

COMPANY NEWS

A silver plaque for the most outstanding industrial equipment exhibit at the eighth Electrical Engineers Exhibition at Earls Court has been awarded to Brush Electrical Engineering Co., a member of Hawker Siddeley Industries Ltd., for their new dry-type, flameproof, mining transformer.

As from April 4, 1959, the new address of John Taylor and Sons will be Suffolk House, 5 Laurence Pountney Hill, E.C.4. The new telephone number will be Mincing Lane 7351.

Panelec (Great Britain) Ltd., manufacturers of floor warming systems and heating equipment, have decided to integrate their activities with those of the parent company, British Insulated Callender's Cables Ltd. As from March 30, Panelec will operate as the Heating Division of British Insulated Callender's Cables Ltd.

CONTRACTS AND TENDERS

Burma

One Rock Cutting and Grinding Machine with both rock cutting and grinding plates. One Hydraulic Rock Splitting and Crushing Machine, 8 tons pressure. Project Implementation Order No. 82-29-103-9-80035. Tender No. 112. Issuing authority and address to which bids should be sent: Union of Burma Applied Research Institute, Ministry of Industry, Kanbe, Rangoon, Burma. Closing date, May 9, 1959. Ref. No. ESB/4818/59/ICA. Telephone inquiries to Chancery 4411, extension 354.

India

Jaw Coal Crushers for use in the Indian Coal Mines. Tender forms on request from the India Supply Mission, 2536 Massachusetts Avenue, N.W., Washington 8, D.C., Director-General, India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, England; and Director-General of Supplies and Disposals, Shahjahan Road, New Delhi, India. Quote reference Tender No. SE-43. Closing date, May 26, 1959. Ref. No. ESB/6086/59. Telephone inquiries to Chancery 4411, extension 738 or 771.

Spain

Copper, Primary Forms, including Scrap. PA 52-6921-99-P1-9203. Terminal delivery date, 31/1/60. Value, \$U.S.3,900,000. Ferrous Scrap. PA 52-6603-99-P1-9204. Terminal delivery date, 31/1/60. Value, \$U.S.3,000,000. Manganese Ores and Concentrates. PA 52-6507-99-P1-9205. Terminal delivery date, 31/1/60. Value, \$U.S.800,000. Nickel and Nickel Base Alloys and Nickel Products. PA 52-695-99-P1-9207. Terminal delivery date, 31/1/60. Value, \$U.S.500,000. Ref. ESB/4203/59/ICA. Telephone inquiries to Chancery 4411, extension 354.

Spain

Blister copper, minimum 98.5 per cent Cu content, in slabs and/or ingots, maximal weight, 1,000 (thousand) lb. Procurement Authorization, No. 52-6921-99-P1-9203. Issuing authority and address to which bids should be sent, Compania Auxiliar de la Industria del Cobre, S.A., Principe 12, Madrid. Closing date, April 6, 1959. Ref. ESB/7010/59/ICA. Telephone inquiries to Chancery 4411, extension 354.

A four-year sales contract has been signed between North Rankin Nickel Mines and Sherritt Gordon Mines. It provides for a maximum delivery of 28,000,000 lb. (maximum of 7,000,000 lb. annually) of nickel. North Rankin plans to substantially increase its production now that it has an outlet assured, and to share in an intensive exploration drive on the western coast of Hudson Bay.

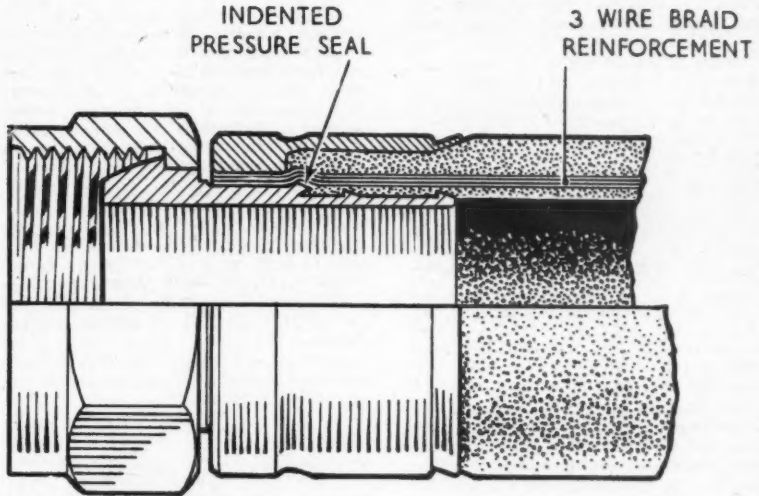
Machinery and Equipment

New Flexible Hose for the Mining Industry

An extra high-pressure flexible hose for use in the mining industry has been developed by Dunlop. Intended for the conveyance of gases and fluids, it is expected to be of particular value in mining, rock drilling, and other conditions where flexibility, resistance to vibration, and high working pressures are required.

The new pipe, which is reinforced by high-tensile steel braid, has 1½ in. dia. bore and a working pressure of 4,000 p.s.i. The use of nitrile rubber for the seamless inner lining enables it to carry nitrogen, mineral and vegetable oils, petrol, paraffin, and coolants. There is an abrasion-resistant neoprene outer cover, which is spark-proof and highly resistant to oil, steam, and exposure to sunlight. Operating temperatures for fluids or gases are up to 130 deg. C., and ambient temperatures are from minus 30 deg. C. to plus 100 deg. C.

The metal end fittings are swaged on to the rubber hose, forming an indented pressure seal. The steel insert has an integral annular ring with a wedge-shaped seating formed on the underside, which makes contact with the face of the inner lining tube. The design of the ferrule or sleeve ensures that during swaging the seating will indent the face of the rubber to form a leak-proof seal.



Above is a section of Dunlop's new 1½ in. dia. bore flexible hose. The hose withstands pressures up to 4,000 p.s.i.

EXTENSION TO RANGE OF AIR MOTORS

To the well-known range of Holman Rotomotors have been added three new sizes. They are the size 60, 4 and 5 Rotomotors, which are of 4, 6 and 7.5 b.h.p. capacity respectively. Holman Rotomotors are now available in eleven sizes, both reversible and non-reversible types, and are of the following capacities: 0.75, 1.5, 2.25, 4, 5, 6, 7.5, 12, 13, 15, and 16 b.h.p.



Below is the new Allis-Chalmers lubrication system. In centre, the new Holman Size 60 ND base-mounted Rotomotor

Rotomotors, which are used for powering haulages, pumps, conveyors, fans, standby units in the event of power failure, etc., employ power units of the vane type which produce very efficient air consumption/b.h.p. figures without loss of simplicity.

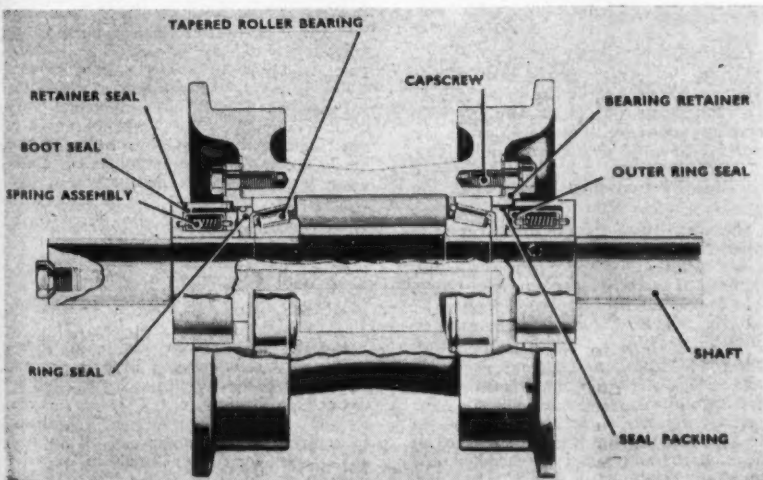
The new size 4 and 5 Rotomotors run at speeds between 3,300 and 360 r.p.m., and the size 60 runs at speeds between 3,850 and 180 r.p.m. to suit requirements. Direct drive, single, double, or treble reduction gearboxes are available, base or flange mounted. Forward and reverse control is by hand lever or a dead man's handle.

LIFELONG LUBRICATION

Mackay Industrial Equipment Ltd. report that Allis-Chalmers now announce that as a result of research in their laboratories and in the field, greasing of positive seal truck wheels, front idlers and support rollers for their entire crawler tractor range has now been eliminated on all new machines.

Once lubricated at the time of assembly, the track group need no further greasing attention, other than periodical checks to ensure the rollers are not leaking due to damage or to track misalignment. The design and free roller characteristics of the positive seal tapered roller bearing wheels which have been proved by more than 2½ billion truck wheel hours is unchanged.

The report states that this is an added operating advantage which now makes possible complete elimination of greasing the track assemblies regardless of mud, water, or other adverse operating conditions.



A RADIO-TELEPHONE TERMINAL

Designated the MC10, a new five-channel transistorized V.H.F. radio-telephone terminal has been developed jointly by Redifon Ltd. and Siemens Edison Swan Ltd. The equipment is a compact unit providing five high-grade telephone circuits. The measurements are: height, 51 in.; width, 23 in.; depth, 19 in.; the weight being 266 lb.

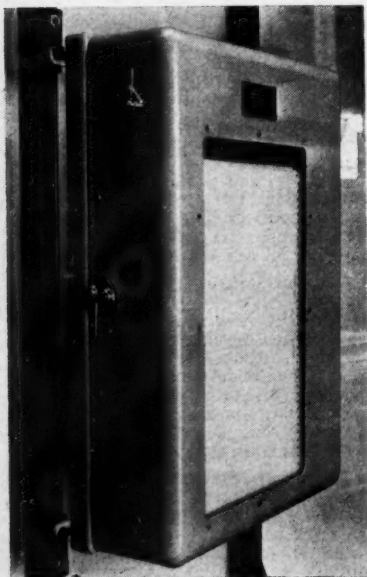
MC10 is intended for use over short or medium distances, and is ideally suitable for operation in independent systems such as those operated by mining companies and similar operators. The equipment is, additionally, suitable for emergency use owing to the ease with which it can be transported and installed; all units are readily removable through the use of multi-way plugs and socket connections. The new equipment comprises both radio and carrier telephone equipment.

The radio transmitter and receiver conform to C.C.I.R. specifications in all characteristics. The standard frequency range is 156 to 184 mc/s, though other frequency ranges may be supplied.

The five high-grade telephone channels, which are 4 kc/s. spaced, are complete with out-of-band signalling equipment and 2/4 wire terminations. The signalling equipment can be arranged for handling dialled impulses, ring down, or junction working.

THE ELECTRICAL ENGINEERS' EXHIBITION

Metropolitan-Vickers Electrical Co. Ltd. occupied stand No. A2 at the Electrical Engineers' (A.S.E.E.) Exhibition, at Earls Court, from March 17-21. Prominent among the company's exhibits was a 132 kV. airblast circuit-breaker, one of the largest items in the exhibition, and a Type M21 resistor transition on-load tap-changer. An item of special interest was a two-speed change-pole squirrel cage motor incorporating new features in winding design. There were also other new items on show, namely, the new Type SN rotary synchroscope, the new Type RB mine hoist chart recorder and the Type LS5 limit switch. The RB mine hoist chart recorder is illustrated below.



Technical Briefs

New Type of Silver Anode

Johnson, Matthey and Co. Ltd. announce that they have recently investigated the influence that different metallic structures and physical conditions have upon the performance of high-purity silver anodes in silver-plating baths. Several important conclusions were reached and as a result the company has developed a new type of silver anode.

Matthey C.A. anodes, because of special processing, have a structure consisting of small equi-axed grains and are particularly resistant to flaking or shedding in high-speed plating baths. Moreover, the anodes show remarkable tolerance to variations in the composition of the electrolyte and in anode current density.

Further information on the research results is available on application to the company's head office.

O-DITHIOLS IN ANALYSIS

Writing in *The Analyst*, vol. 84, R. E. Clark and C. E. Tamale-Ssali point out that the zinc complex of toluene 3:4 dithiol is recommended as a reagent for the testing of copper, silver, gold, zinc, tin, lead, vanadium, arsenic, antimony, bismuth, molybdenum, tungsten, free sulphur, selenium, tellurium, manganese, iron, cobalt, and platinum in their ores and minerals.

By carrying out simple procedures, which are suited to field conditions, most of these elements can usually be detected in the coarsely powdered mineral in one minute. The procedures are standardized, as far as possible, to permit the maximum information to be gained from the tests. Interferences are rare and can usually be avoided.

It can be observed that in prospecting and in the laboratory there is still the need to identify minerals quickly without resorting to specialized methods involving the use of specific apparatus and personnel specially trained to operate the apparatus.

ANTI-FOAMING AGENT

Used in the treatment of smoulder water in the coal industry, Antispumin 7517 is an anti-foaming agent of universal application with approximately 100 per cent active substance. Poured into water at 20 to 40 deg. C. (68 to 104 deg. F.), the product produces yellowish, coarsely dispersed emulsions of optimum anti-foaming efficiency.

The stability of the emulsions may be improved by adding to the diluent water before addition of the product a small amount of soda, trisodium phosphate, etc. However, this improvement in the stability of the emulsion is associated with a decrease in the anti-foaming effect.

The stability of the emulsion is largely independent of the hardness of the water used for preparation. In addition, the presence of salts of polyvalent metals in the solutions to be de-foamed has no effect on the activity of the product. At temperatures above 40 deg. C. (104 deg.

F.) a distinct decrease in the stability of the emulsions may be observed.

Antispumin 7517 may be added as anti-foaming agent both to neutral and to acid and weakly alkaline solutions. In alkaline liquors, the anti-foaming effect decreases with increasing pH. This is due to the saponification of the fatty acids in Antispumin 7517 if the liquor is strongly alkaline. There is an exception to this rule in the case of alkaline solutions containing ions of polyvalent metals. In such solutions there is no decrease in the anti-foaming effect even at pH values over 10.

CORROSION OF NICKEL IN SULPHURIC ACID

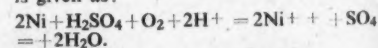
Corrosion of a metal in an aqueous solution may occur galvanically, or directly by electron transfer (oxidation-reduction) at a single site on the surface.

Kinetic Study of the Corrosion of Nickel in Sulphuric Acid (Pitt and Wadsworth, U.S. A.E.C. publication NP-6208), investigated the latter process in relation to corrosion of nickel in sulphuric-acid solutions, in the temperature range 75 deg. C. to 125 deg. C. and under an oxygen atmosphere at a partial pressure ranging from 0 to 600 p.s.i. (0.026 t.s.i.; 0.04 kg./mm.²).

The influence, on the corrosion rate, of the following factors was determined by a series of experiments (run for periods between 30 and 70 minutes), in which each variable was changed in turn: agitation of the solution, time, temperature, oxygen concentration, concentration of species furnished by sulphuric acid, surface area of the sample, concentration of products.

The corrosion rate was found to vary linearly with time and to increase directly with increase in oxygen partial pressure. No appreciable corrosion was observed in the absence of oxygen, and the corrosion rate was not affected by agitation above a certain speed of stirring.

These results, and data obtained from varying the concentrations of acid, are considered in relation to the corrosion mechanism involved. It is suggested that corrosion progresses by single-site adsorption of the un-dissociated acid molecule, which in turn reacts with oxygen. Calculation of the number of possible sites indicated that a given instant a very small percentage of the nickel surface is reactive and that corrosion may nucleate at dislocations and travel concentrically along grain surfaces. The overall reaction is given as:



POWDER METALLURGY TERMS

For the purpose of assisting the development of powder metallurgy in various countries of the world, it is proposed to publish, in future issues of *Metal Powder Report*, a glossary or set of definitions (in a variety of languages) of all important terms commonly used in powder metallurgy.

Metals and Minerals

Aluminium's Prospects

West Germany's aluminium industry—with the notable exception of the primary producers—developed more favourably in 1958 than had been anticipated at the beginning of the year, according to the board of Aluminiumwerke Nürnberg G.m.b.H. (Nürbal).

International statistics, it was stated, showed that world consumption of aluminium in 1958 had declined by around 3.7 per cent, mainly due to a reduction in industrial activity in several areas of the western hemisphere. Despite an advance in the level of home consumption, West German output of aluminium declined by around 2.1 per cent, trends in the primary and secondary industries being directly opposed. There was no change during 1958 in the overall capacity of the industry at 165,000 tonnes. No increase in output is planned for the current year, because high costs of electric power and current trade conditions make it more economic to import the supplementary quantities required.

Nürbal considers that the outlook for the West German industry this year is not unfavourable. The company predicts that the pressure of excess supplies of virgin aluminium will still be left on the world's markets. However, with the slightly less favourable import conditions for foreign material which came into effect at the turn of the year, and having regard to the reduction in the price of the domestic virgin metal, the company anticipates that home capacity will be better employed, with a consequent increase in output.

So far as the United States aluminium outlook is concerned, the Chase Manhattan Bank states that, while there is room for optimism in the long-term future, the industry faces a series of difficult problems in the period immediately ahead. The 1946-56 decade saw a phenomenal expansion of peacetime uses, but in the past two years capacity has expanded more rapidly than use. Production reached a new high level in January, yet the industry operated at only 83 per cent of capacity. Moreover, capacity is slated to increase almost one-fifth by the end of 1960. Thus a rise in sales of nearly 40 per cent above the January level would be required for capacity operation by the end of next year.

The industry, however, has "a record of aggressive and successful development of new markets". Prices are becoming competitive with other materials in more and more uses. The long-term growth potential remains impressive.

*

In 1958, 100,000 tons of bauxite was exported from the recently discovered fields at Sematan, west Sarawak. Some 60,000 tons more is to be shipped in the next two months.

*

Reynolds Metals is designing an alumi-

nium submarine which, it is claimed, should be able to go to a depth of more than three miles and bring 60 per cent of the area of the world's ocean floors within reach. The first model of this submarine, called the "Aluminaut", may be ready for trials in a few years. It will be battery-powered, but later ones could have a nuclear engine.

ZIRCON AND RUTILE

The upward pressure in shipment prices for zircon still persists and prices continue to harden. Dealers report that many inquiries are circulating and supplies are not easily obtainable. How far the present movement will go remains problematical, although still higher levels in the course of the next few weeks would occasion no surprise.

Interest has been shown for as far forward as late 1960, but producers are chary about entering into such long-term commitments, due to the fact that zircon is almost entirely a by-product of rutile production, for which the outlook still remains unpromising.

In contrast with the upward trend in zircon prices, those for rutile show no signs of recovery as yet from the low levels to which they have sunk. Dealers say that a certain amount of business is passing, but that it is insufficient to bring about a recovery in prices.

QUICKSILVER RISES FURTHER

The upward pressure in the London quicksilver price persists. For metal for immediate delivery ex-warehouse, London, dealers now indicate £77 a flask. The price has risen £3 during the past two weeks. A certain amount of business is always circulating, but it still lacks weight, the steadier tone of the market being attributed mainly to reduced arrivals of Mexican metal. In this connection, there are reports that exceptionally heavy rains in Mexico have adversely affected production. In the circumstances, Mexican metal for shipment is difficult to quote, but a nominal price of £73 10s. to £74 per flask c.i.f. has been suggested.

United States quicksilver prices have been advancing in New York. Quicksilver, domestic, f.o.b. New York, is currently quoted at \$226 to \$229 against \$218 to \$222 as recently as March 17.

SPECIAL METAL FACILITIES

Indicative of the growing commercial importance of the newer metals is an announcement by the Manufacturing Chemists' Association that numerous facilities for the production of chemical-process metals will be constructed in the United States during 1959 and 1960 at an

estimated cost of \$33,500,000. According to the annual M.C.A. survey, chemical producers completed additional facilities last year for special metals processing at a cost of approximately \$141,200,000. Included in the "special metals" field are such products as alumina, beryllium, boron, niobium, quicksilver, tantalum, titanium, uranium, vanadium, and zirconium, all of which are refined or modified by chemical processing.

BORON STAINLESS

The Carpenter Steel Co., a U.S. firm, recently announced the first commercially available type 304L stainless steel containing 2 per cent boron melted in electric arc furnaces. This development is of particular significance to the commercial atomic energy field, where the 2 per cent boron stainless is used for nuclear reactor control rods and as a shielding material. Previously the material had to be melted in vacuum furnaces, which limited the size of the melt.

THE LONDON METAL MARKET

The main price movement during the week has occurred in the copper market which at one time was almost £15 per ton below the highest point reached this month. This fall was brought about largely by the liquidation of speculative positions on Comex, which spread automatically to this country when some people found it difficult to sell in New York. The Belgian copper price has also been reduced by the equivalent of almost 1 c. per lb. and now stands at the equivalent of about 31 c. Antwerp or New York. Copper stocks in Britain again showed an appreciable increase of over 600 tons and this has led to a slightly lower backwardation, although it is now expected that this may increase again as it is believed that there are some shipments of metal to be made out of this country.

The tin market has developed a weak undertone mostly due to continuous selling in Singapore and lack of consumer demand. On Wednesday the Eastern price was equivalent to £814½ per ton c.i.f. Europe.

The lead and zinc markets have also been weaker in sympathy with the copper market, and in the case of zinc especially there has been marked selling of current month material which has almost completely eliminated the backwardation.

Closing prices and turnovers on Wednesday were:—

	Mar. 19		Mar. 25	
	Buyers	Sellers	Buyers	Sellers
COPPER				
Cash	£250½	£251	£247	£247½
Three months ..	£248½	£248½	£246½	£246½
Settlement ..	£251		£247½	
Week's turnover	11,850 tons		9,675 tons	
LEAD				
Current ½ month	£69½	£69½	£66½	£66½
Three months ..	£71	£71½	£68½	£68½
Week's turnover	5,100 tons		6,625 tons	
TIN				
Cash	£782	£783	£773½	£774½
Three months ..	£786	£787	£778½	£779
Settlement ..	£783		£774½	
Week's turnover	510 tons		985 tons	
ZINC				
Current ½ month	£75½	£75½	£73½	£73½
Three months ..	£74½	£74½	£72½	£73
Week's turnover	5,825 tons		7,150 tons	

This week we go to press on Wednesday on account of Easter and all our market notes are accordingly written a day earlier than usual. For this reason our metal market news has been abridged and the two-week period covering the Easter holidays will be reviewed in our next issue. London Metal and Ore Prices appear on inside back cover.

Mining Finance

Uranium Costs Declassified

The last wisp of the veil of secrecy which once surrounded South African uranium producers has now been lifted. The mines concerned are now able to publish full details of the price received for their output, and, as a necessary corollary, the treatment costs at the leaching plants. In fact, although the figures are now known officially for the first time, it has always been possible to estimate cost and price levels by comparing data published by the South African companies with information from producers in less reticent countries. In the event, the figures now published correspond quite closely with these estimates.

It appears that release of cost and price data for any individual producer will await the publication of the relevant annual report, so that the only figures so far available are those for the three "U" producers of the J.C.I. group. This information is of limited value, because all of these companies are, in a sense, special cases. Thus Randfontein is one of the "two-division" mines, with a clear separation between gold operations and uranium operations; Freddie's has to calculate development payability on combined gold/uranium content, although it is nominally a by-product producer, with the further complication that its uranium is produced at the O.F.S. joint plants; and E. Champ d'Or is primarily a uranium producer with, moreover, considerable difficulties in keeping up the tonnage supplied to the Randfontein plant. Since most South African uranium producers are by-product producers, the situation at the J.C.I. mines by no means reflects the overall picture. With this caution, the newly released information is tabulated below.

Mine	Cost		Uranium Revenue	
	per lb.		per lb.	
	s.	d.	s.	d.
Randfontein ...	73	3*	94	4
E. Champ d'Or ...	90	6†	97	0
Freddie's ...	50	2	84	3

* After crediting by-product gold.

† Including rental paid for use of Randfontein plant.

OTHER POINTS FROM THE JOHNNIES' REPORTS

At E. Champ d'Or, the technical position, which was becoming extremely difficult, has been relieved by the discovery that the Footwall Reef contains patchy but satisfactory uranium values. No indication is given as to whether this addition to previously known reserves will enable the company to continue operations until the end of its contract in 1964.

Although operations in Randfontein's gold section were curtailed by more than 58 per cent in 1958, it is anticipated that 1959 mill throughput in this section will not be less than the 311,000 tons milled in 1958. In the uranium section, full capacity was reached in July, and operations thereafter had to be slightly curtailed to bring output within the limits of permitted sales.

The future of Freddie's remains obscure. It was hoped that an increase in the rate of stopping during 1958 would enable small profits to be earned. In fact, no acceleration was possible, and an increase in working costs resulted in an overall loss of £207,057. Forward development is to be suspended throughout 1959, while efforts to increase the stopping rate will continue. Even if this policy results in a cessation of the heavy losses of 1958, however, a long and desperate fight will still be needed to bring Freddie's to the ranks of the dividend payers.

AN EMPTY GESTURE

At first sight the new tax concession for ultra-deep mines announced by Dr. Dinges in his Budget speech on Wednesday, would appear to be a valuable incentive to mines looking for deep ore. In future, the arrangement by which new mines operating below 7,500 ft. are allowed to add 5 per cent per annum to their capital amortization allowances is to be extended to mines already operating.

In view of the fact that most of the old mines working at great depths pay little or no tax already, little of the benefit of the new concession will be felt by those producers who need help most—the marginal producers of the Central Rand. Indeed, even those mines that will be in

a position to benefit will hardly jump for joy at the new concession when Dr. Dinges' own estimate of the loss in taxation revenue in 1962 is only £50,000 to £100,000. This is a mere drop in the ocean of taxation. West Driefontein pays more than twice this figure to the government each month.

Other points of interest from the S.A. Budget are an increase after July 1 from 10 per cent to 20 per cent in initial allowances against new industrial machinery and an allowance of 2 per cent per annum against new industrial buildings. This is one more reminder that when efforts to restimulate secondary industry eventually take effect, repercussions in the gold industry are bound to be felt on labour availability and eventually, no doubt, on labour costs.

ALGOM DIVIDEND PRONTO?

The annual meetings of two of the Blind River uranium producers of the Rio Tinto group were held in an optimistic atmosphere in Toronto last Friday.

Addressing Pronto stockholders, Mr. W. H. Bouck, the president, recalled that a maiden dividend of 75 c. was paid last December. Gross revenue for the first two months of 1958 had totalled \$2,048,000 for a net profit of \$954,000, so that the company might well be in a position to pay another dividend this summer. Mr. Bouck thought prospects were good for a two-year extension of Pronto's sales contract, which expires at the end of 1960. Pronto will become liable for tax in May this year, but the incidence will be reduced by pre-production write-offs and amortization allowances.

At the Algom meeting, Mr. Bouck said that the company would be in a position to pay its first dividend after

A panoramic view of the main store, workshops and No. 2 Shaft at the Free State Saaiplaas Mine. In the background is the No. 1 Shaft. F.S. Saaiplaas is the newest of the mines administered by the Gold Fields Group. At December 31, 1958, No. 1 Shaft had reached its final depth of 5,853 ft., while No. 2 Shaft had reached 6,266 ft.



April 30 next. The bank loan of almost \$1,500,000 was repaid in full early this year, and it is anticipated that all the 5 per cent general mortgage debentures will be redeemed on April 30. At the year-end, \$23,723,000 was outstanding, of which \$13,830,000 was to be repaid during 1959.

ANGLO PAYS SAME

On Wednesday the Anglo American Corporation declared a final dividend for 1958 of 6s. per share which, with the interim of 2s. makes an unchanged total of 8s. for the year. Subject to final audit the 1958 net profit after tax amounted to £5,890,000 compared with £4,993,649 in 1957. Some part of this rise is, no doubt, attributable to the tax-free sales of shares to A.S.A.I.C. This view is possibly confirmed by the fact that the allocation to general reserve has been increased by £500,000 to £1,500,000. The general reserve now stands at £24,500,000.

African and European Investment Co. is also paying an unchanged final dividend, in this case of 3s. to make 4s. for the year.

IMPROVEMENT AT KONONGO

At the meeting of Konongo Gold Mines this week, Mr. R. Annan, the chairman, said that development since the year-end has been giving satisfactory results. An interim calculation at January 31 showed a net gain in reserves of 20,000 tons. The value, however, was slightly lower.

A recent reef exposure in the footwall drive on No. 12 level, Boabedroo section, was described by Mr. Annan as the most encouraging for some time. A continuous length of 185 ft. has averaged 18.4 dwt. over 94 in., with the north face still in good values. Nothing is yet known of this reef on the Nos. 11 and 13 levels.

Mr. Annan's statement is on page 354.

A.S.A.I.C.'S FIRST REPORT

The annual report of the American-South African Investment Company could easily be mistaken for a rather high-class sales brochure. Indeed, the resemblance is not merely superficial, because from the outset it was apparent that one of the company's main tasks would be to convince the United States investing public of the investment opportunities offered by the Kaffir mines.

This is a job admirably performed by A.S.A.I.C.'s first report. The purely formal items—the balance sheet, notes, auditors' and directors' reports, etc.—have been relegated to a separately bound pamphlet, and the report itself contains only the chairman's statement, a summary of the progress of the South African gold mining industry in 1958, and a series of excellent photographs illustrating operations on a modern mine.

At December 31, the net asset value of A.S.A.I.C. amounted to some £12,878,084, equivalent to some £10 14s. 8d. per share. Income for the period September 23 to December 31, which consisted mainly of semi-annual dividends from gold mining companies, totalled £344,398, which, after all charges, left a net income exclusive of share dealing, of £225,073. Net profit in sales of investments—made necessary by the company's prospectus commitment not to hold any single share block in

(Continued overleaf)

LONDON MARKET HIGHLIGHTS

A cautious feeling crept into the South African gold share market last week. For one thing, nobody was keen to deal immediately in front of the South African Budget. In the event, however, the new proposals proved comparatively innocuous, albeit mildly bearish. The approaching Easter holidays coming towards the close of a three-week Stock Exchange account were another restraining influence.

Consequently interest tailed away in Free State Geduld, although the price showed some resistance at 167s. 6d. Western Holdings came back to 145s. and Lorraine softened to 33s. 4½d. The last-named had previously moved up to 34s. following the annual report on hopes that the underground reef development picture would be brought up to date in the March quarter's report.

The older mines were again left very much to themselves although the Cape occasionally bid for Consolidated Main Reef (20s.). In the Finance group, Anglo American moved up to 173s. 9d. at one time on hopes of a higher dividend, but few expected any increased payment from Union Corporation and despite their high investment standing the shares relapsed to 52s. 9d.

De Beers became outstanding in the Diamond group. Buyers were impressed with talk of a fresh improvement in diamond sales in the current quarter and the shares advanced to 134s. 4½d. before later reacting to 132s. 6d.

The Copper share market remained sensitive to Wall Street which continued to blow hot and cold by turns. Nor were matters helped on Monday either by the sharp reaction of the metal price or the fresh attention drawn to the Central

African labour troubles in the latest White Paper. Bancroft however, kept up well at around 27s. 6d. with buyers looking forward to the resumption of operations next week. Messina issues were also fairly firm, Cape optimism about next month's interim playing a large part in this. On Tuesday the price of copper recovered to £246.

The previous week's rise in Lead-zinc shares came to an abrupt halt. Neither of the respective metal prices gave any-one cause for enthusiasm and where there were profits to be had they were soon taken by earlier buyers. Broken Hill South shares had to contend also with the news that because of the coming curtailment of operations at the mine, layoffs of workers were planned, and the shares weakened to 46d. 9d. Consolidated Zinc eased to 61s. 6d. and the new shares were 13s. 3d. premium after touching 14s. premium.

The approaching new sales quota period for tin with its slightly higher allocations had a curious effect on the share market. Realizing that the better quotas would help producers, particularly those whose particular quota assessment had been poor, the share market moved ahead on Monday. But on Tuesday, the metal price dropped below the £780 line for the logical reason that the beginning of any new quota period brings a fresh influx of tin from the mines and consumers thus tend to hold off for a while in the hope of getting cheaper metal later on. So tin share prices then eased with the metal. Siamese, however, held a previous rise at 8s. 4½d. and buyers were still about for Sungei Besi (17s.).

Elsewhere, Australian issues were enlivened by the advance in Lake View and Star to a nine-year peak of 26s. 3d.

BLINKPOORT GOLD SYNDICATE LIMITED

(Incorporated in the Union of South Africa)

CHAIRMAN'S STATEMENT AT 25th ANNUAL GENERAL MEETING

In the absence of the Chairman, Mr. H. C. Payne presided at the Annual General Meeting held in Johannesburg on March 5, 1959.

In addressing shareholders he referred, *inter alia*, to the notable increase in the dividend income of the company, and pointed out that in keeping with its established practice the dividends declared during the year, aggregating 57½ per cent or 2s. 10½d. per share, had absorbed virtually the whole amount available for distribution.

He directed the attention of shareholders to the fact that the company's investments in Orange Free State Gold Mining companies had been classified as Fixed Investments in the Balance Sheet in keeping with the policy followed since their acquisition. He pointed out that the market value of the investment portfolio had increased very substantially since September 30, 1958, to the aggregate amount of £10,469,208 on March 4, 1959, because of the appreciation in the value of the holding in Free State Geduld Mines Limited, which amounted to well over 90 per cent of the total value of the

portfolio. For this reason the Directors had decided to disclose to shareholders that the company held 1,295,908 Free State Geduld shares. The remaining interests, which were relatively small, were in the President Brand, President Steyn, and Welkom Gold Mining Companies.

In dealing with the position of Free State Geduld Mines Limited, he stated that the working profit of the mine for the five months ended February 28, 1959, had amounted to £2,023,885, an improvement of £468,531 over the corresponding period in the preceding financial year. He suggested that the development values recently disclosed by that company, considered in conjunction with the very high borehole values reported in the past, should be regarded as extremely encouraging, holding out promise of substantially increased dividends in the future.

ASHANTI GOLDFIELDS CORPORATION LIMITED

NOTICE IS HEREBY GIVEN that THE TRANSFER BOOKS WILL BE CLOSED from the 2nd April, 1959, to the 8th April, 1959, both dates inclusive, for the preparation of Bonus Issue Lists.

By Order of the Board,
E. W. MORGAN, Secretary.

Registered Address:
10 Old Jewry, London, E.C.2.
24th March, 1959.

LYDENBURG PLATINUM LIMITED

(Incorporated in the Union of South Africa)

At the Annual General Meeting of Lydenburg Platinum Limited, held in Johannesburg on February 12, 1959, the Chairman, Mr. C. S. McLean, presided.

After declaring the meeting properly constituted, the Reports of the Directors and Auditors, and the Balance Sheet and supporting Accounts as at August 31, 1958, were taken as read. The Chairman then addressed the meeting as follows:—

In recent years the Company's main source of income has been its substantial investment in Waterval (Rustenburg) Platinum Mining Company Limited, which holds 39 per cent of the issued capital of the producing company, Rustenburg Platinum Mines Limited. For the year ended August 31, 1958, the latter company declared no dividends and consequently no income was received from the Waterval company. Dividend income declined, therefore, to the small amount of £10,406 derived from shareholdings in Orange Free State Gold Mining companies. Interest revenue increased slightly, and there was a small decrease in administration and other costs. It was, therefore, only possible to declare a Dividend of 4½ per cent for the year, compared with the distribution of 23½ per cent for the preceding year. One of the factors which influenced the Directors in distributing the full amount of the net profit for the year, and a small proportion of the unappropriated profits brought forward, was the desire to avoid the possibility of paying a large amount of undistributed profits tax.

The investment in quoted shares at August 31, 1958, relating almost entirely to the holding in Waterval (Rustenburg) Platinum Mining Company Limited, was £598,155—the Stock Exchange value being £875,580, a decline of slightly more than £1,000,000 over the financial year. This asset, however, is still a very important section of the Company's business and it will, therefore, be of more than a little interest to shareholders to have the future outlook of Rustenburg Platinum Mines Limited reviewed in the light of the statement issued to shareholders of that company by its Chairman at the Annual General Meeting held on February 5, 1959. In that address, Mr. D. A. B. Watson presented an exhaustive review of the past year's operations, of the conditions then prevailing in the platinum market throughout the world, and of the future possibilities.

Of the decrease in the total volume of sales by the producing company during the year ended August 31, 1958, about two-thirds occurred in the United States and one-third in the United Kingdom. As regards its sales of platinum to the different types of industrial users, diminished demand from oil refineries in the United Kingdom and the United States accounted for about 70 per cent of the decline in its total sales in those two countries.

Notwithstanding the fact that the platinum offered by Russia during the year under review was less than in each of the two preceding years, the sales were nevertheless material and had, and continue to have, a marked effect on the platinum market. The supplies from Russia, Mr. Watson stated, provided a strong competitive element in the market with a consequential depressing effect upon prices. In referring to the drop in the price of platinum over the past eighteen months, he stated that in his opinion the price had reached such a

level as to be likely, in due course, to discourage a continuance of the free flow of platinum on to the world market.

In dealing with the outlook for the future, Mr. Watson referred to the marked reduction in sales to the oil industry throughout the world, and stated that there were as yet no signs of any significant change for the better—that industry's reduced requirements during the past year having been met, to a large extent, from its accumulated stocks. However, there were no indications at present of any major change in the techniques involved in the production of high octane fuel by the use of platinum catalysts and, should no adverse change occur and the increase in world refining capacity continue as expected, there was every likelihood that overall sales of platinum to that industry would again increase as stocks now in the hands of oil refining companies became depleted.

Mr. Watson mentioned various factors which would affect the company's financial position favourably in the immediate future. These were the disposal of a substantial portion of the excess stock of platinum produced during the last two years, the considerable redemption allowance currently available for taxation purposes following the heavy capital expenditure in recent years, and the negligible capital expenditure during the current year.

In thus indicating to the shareholders of Rustenburg Platinum Mines Limited the possibility that the current year's operations may result in an improvement in its financial position, Mr. Watson emphasized that such results, if achieved, would not necessarily be indicative of the results which might flow from a similar level of sales in future years, when some or all of the factors to which he had referred might no longer be operating.

He concluded by stating that he was not prepared to forecast when Rustenburg Platinum Mines Limited would resume payment of dividends as the position remained extremely uncertain. It would be necessary to assess the results of the financial year in September, 1959, in the light of the probable future market conditions at that time, before deciding upon the magnitude of the appropriations to be made.

Your Company's other main investments are in property through its substantial interest in the Vanriebeekstad Development Company (Proprietary) Limited, a subsidiary operating in the Orange Free State, the Staalberg Township and the adjoining farm Quaggasfontein in the Vereeniging District, Transvaal.

Sales of stands in Riebeeckstad Township were disappointing during the past year in keeping with the generally depressed conditions in the property market. During the year certain amenities were provided in the township for the benefit of residents and these have proved extremely popular. It is anticipated that they should have a beneficial effect on future sales in that township. Recently a further housing scheme has been negotiated with a well-known building company and this will be launched shortly. It is hoped that it will have the effect of encouraging owners of stands to build their own houses in this developing township. Its future is intimately bound up with the development of the Free State Gold Fields as a whole and the recent very encouraging development of

Free State Geduld Mines Limited should, in due course, prove of considerable benefit to business generally in the Orange Free State Gold Fields, with a consequent stimulating effect on the sales of stands in this township.

The Company continues to hold mineral rights over certain farms in the Orange Free State.

I now beg to propose that the Directors' Report and Accounts as submitted be and they are hereby approved and adopted, and that all acts and things undertaken by the Directors on behalf of the Company during the year be and they are hereby confirmed."

This proposal was seconded by Mr. H. Ohlthaver and there being no questions was put to the meeting and carried unanimously.

It having been unanimously agreed that the retiring Directors be re-elected by a single resolution, Sir George W. Albu, Bart. and Mr. H. Ohlthaver were duly re-elected Directors of the company.

The remuneration of the auditors, Messrs. Alex Aiken and Carter, for the past audit, was fixed at the sum of one hundred and twenty guineas and they were duly re-appointed auditors for the ensuing year.

The Special Resolution amending the Articles of Association was put to the Meeting and carried unanimously.

MINING FINANCE—Continued

excess of 5 per cent of total assets—came to £107,537.

NEW LAKE VIEW TAX ARRANGEMENTS

New tax arrangements for the convenience of non-U.K. shareholders are announced by Lake View and Star. By agreement with the revenue authorities, the portion of any dividend derived from exempt trading income may be paid tax-free to shareholders not resident in the U.K. Approximately 94 per cent of Lake View's dividends are deemed to be paid from exempt income.

If Lake View ceased to qualify as an O.T.C., a liability of about £35,000 (on the basis of current dividends) would have to be met by the company. This is obviously an unlikely event, but the contingent possibility makes it necessary for the directors to obtain shareholders' consent before the arrangements can be put into operation. An E.G.M. will, therefore, be held in London on April 23 to consider the proposals.

H.E. Proprietary Rights Details.—Details of the proposed rights offer by H.E. Proprietary have been announced. It has been decided to offer 480,000 5s. shares at 7s. 6d. to existing shareholders in the proportion of one for five. The sum raised will be used in repaying the company's overdraft of £66,000 and in financing the expansion of activities in the U.K. and in South Africa. It is anticipated that it will be possible to maintain the present dividend rate of 22½ per cent on the increased capital.

Rio Canadian Profits Improve.—Group profits of the Rio Tinto Mining Co. of Canada amounted to \$488,497 in 1958. This compares with \$121,819 in the previous year. Accounts of the group's major uranium producers are not consolidated in this total.

THE BRITISH SOUTH AFRICA COMPANY

BENEFITS FROM QUALIFICATION AS O.T.C.

STRENGTHENING OF GROUP'S POSITION FROM DIVERSIFICATION POLICY

COMPANY'S CONTRIBUTION TO KARIBA PROJECT

LORD ROBINS ON A PROGRESSIVE ENTERPRISE

The 61st annual general meeting of The British South Africa Company was held yesterday at The Chartered Insurance Institute, 20, Aldermanbury, London, E.C.2.

Colonel The Lord Robins, K.B.E., D.S.O. (the President), who presided, said:

It gives me great pleasure to present to Members the Report of the Directors and the Consolidated Accounts of the Company and its subsidiaries for the year ended September 30, 1958.

Before I ask you to consider the Report and Accounts may I, as last year, refer to one or two domestic matters. First of all, it is sad for us to have to record the death in November last of our former colleague and President, Mr. Christopher Hely-Hutchinson whose retirement from office had been reported at our last meeting and whose great services to the Company I referred to on that occasion.

The Directorate of the Company is unchanged since we last met but I should tell you that Sir Charles Cumings, who has been our Resident Director and the Company's principal Representative in Africa since April 1957, will be resigning his offices at July 31 next as he wishes to devote a greater part of his time to public affairs than it is possible for him to do in present circumstances.

We have accepted his resignation with regret, and have invited our colleague Lord Malvern to occupy the appointment of Resident Director in a non-executive capacity while the administrative work in Africa will be carried out by two Joint General Managers, responsible direct to the Board.

This is an arrangement which previously had worked well for many years and we have every reason to believe that it will work just as well again.

Of course, our colleague Mr. Harry Oppenheimer is also resident in Africa, and his advice on our affairs is always readily available.

May I say how delighted we are to have Lord Malvern here with us today and we feel sure that when the formal business of the meeting has been concluded, Members will be glad to hear something from him about affairs in the Federation.

O.T.C. Status

Turning now to the Report and Accounts, may I remind you that in my address to you last year I sounded a note of warning that, if the market value of copper and other base metals—especially copper—upon which our royalties are calculated remained at their then levels, our revenue for the year now under review must necessarily fall below that of 1957.

But I qualified that by saying that this adverse situation might be alleviated considerably by the measures which the Directors had taken on March 21, 1958, to secure provisional recognition of The British South Africa Company as an "Overseas Trade Corporation" under the Finance Act 1957.

I am now pleased to be able to report that those measures have had very satisfactory results. The taxation charge shown in the Profit and Loss account reflects a saving of tax on the profits of the year to September 30, 1958, of the order of £750,000. Although the Company only functioned as an Overseas Trade Corporation for just over six months of the year, the tax saving is greater than what it may be expected to be in a full year in future by reason of a change in the method of assessment to Income Tax, the cessation of liability to Profits Tax and the effect of Double Taxation relief.

Last year I gave you an estimate of the Company's probable annual tax saving as an Overseas Trade Corporation. As you probably appreciated that estimate was very soon upset—as can happen to the most carefully prepared estimates—by the subsequent announcement of a change in the rate of Profits Tax.

Although the Company's exempt trading income, which is derived primarily from its mineral revenues, is no longer subject to Profits Tax, the Group's investment income will continue to be subject to that tax.

Nevertheless, the tax saving is still substantial and so long as the Company continues to qualify as an Overseas Trade Corporation, and on the basis of the levels of revenue and expenditure for 1958 and current rates of taxes in the United Kingdom and Overseas, the overall estimated annual tax saving will not be less than £600,000.

The Year's Results

The Consolidated Profit and Loss Account shows that the Group's net revenues from royalties, dividends and interest have dropped by some £2,947,000 when compared with the previous year. Against this, however, the total taxation charge has been reduced by £2,480,000 so that our net profit, after taxation, of £4,363,000 is only £467,000 less than the corresponding figure for 1957.

Out of this profit of £4,363,000 the Directors propose to transfer £1,500,000 to General Reserve and will today recommend for your approval the payment of a Final Dividend of 3s. 3d. per unit of stock or per share, which together with the Interim Dividend of 1s. 3d. already paid, will make a total of 4s. 6d. for the year.

The Directors have also decided to declare a Special Interim Dividend of 9d. per stock unit or share for the year ending September 30, 1959, to be paid with the recommended Final Dividend for the year 1958. This Special Interim Dividend will not be taken into account in considering the payment of further dividends out of the results for the year ending September 30, 1959.

Turning again to the Profit and Loss Appropriation account you will see that the profits made by our subsidiaries of £366,000 have been retained in the accounts of those companies.

After making provision for the recom-

mended Final Dividend and the transfer to General Reserve, the balance of the profit amounting to £193,000 has been added to our unappropriated profits bringing the latter up to a figure of £2,279,000 at September 30, 1958.

Consolidated Balance Sheet

May I ask you now to turn to the Consolidated Balance Sheet. You will already have found a detailed explanation of many of the items appearing therein in the preceding pages of the Directors' Report.

At the date of the Balance Sheet our liabilities, comprising future taxation, staff superannuation and current liabilities totalled approximately £6,900,000. Against these the Group held current assets of £8,760,000 odd, there being thus a surplus of liquid assets of £1,860,000. But as you will have seen from the notes, The British South Africa Company Group had various commitments amounting to over £4,000,000. These include provision for the important outstanding commitments, which will arise during the next few years and which, as I reported to you last year, we have undertaken in respect of the Kariba Hydro-Electric Scheme, The Rhodesian Iron and Steel Company, the Central African Archives and the Land Settlement Scheme for Officers and Men of the United Kingdom Armed Forces.

Main Sources of Income

The Directors' Report has this year given full details of the Group's principal enterprises and I feel, therefore, that it is unnecessary for me to dilate upon them in these remarks. As you are aware, the Group's income comes from three sources, its mineral royalties, its real estates and its investments. As time goes on and the year 1986 approaches, when the mineral rights and revenues in Northern Rhodesia will be taken over by the Government without compensation, the investments held by the subsidiaries, and the investment policy generally will become of prime importance. I think that you will wish me to say something on this subject today and I shall do so as briefly as I can.

First of all, we have endeavoured, in the Report, to give to Members as comprehensive a view as possible of the investment position of the Group as a whole. We have explained why the overall book value of £35,194,334 at September 30, 1958, is not comparable with the book value at the close of the preceding financial year, and we have shown in the 1958 picture the pattern which we aim to follow in future years.

The Group's interest in mining, both in Rhodesia and elsewhere, still forms a major part of the whole portfolio—the mining sections amounting to more than 60% of the total book value. Thus, the development of the mineral resources and the business of mining investment may be broadly said to be the principal activity of The British South Africa Company Group.

In addition, however, to the mining investments to which I have referred, we have in recent years achieved a considerable measure of diversification in the Group's holdings, and this process is continuing. Under the heading of Miscellaneous Rhodesian Interests you will observe a number of industrial and other enterprises in which the Group has substantial participations. We have also mentioned our interests in the Hudson's Bay Company and the British Newfound-

land Corporation Ltd. But it is through our oldest investment subsidiary, The Rhodesia Railways Trust Limited that our policy of diversification is being most actively promoted.

At September 30, 1958, the North American holdings of the Trust amounted to 43% of the total (based on market valuation) as compared with 35% the previous year and 26% at September 30, 1956.

The net profit of this subsidiary company was £223,279, but no dividend has been paid for the year. That is in accordance with our declared policy—referred to on a number of occasions in recent years by my predecessors—of building up out of profits a substantial body of investments. For the year which I am now reviewing the net profits of the subsidiary companies have been retained by them for the further expansion of their business.

Investment Appreciation

At the date of the Balance Sheet quoted investments of the Group at £22,834,081 showed an appreciation of £5,492,424. An approximate valuation of the quoted investments at March 12, 1959, amounted to £29,975,000 showing an appreciation over book value of £9,190,000. In addition there was an estimated undisclosed appreciation on certain of the unquoted holdings at that date of £3,387,000. The book value of unquoted investments has increased by about £1,800,000 since September 30, 1958.

I feel confident that Members will endorse the policy which the Board has adopted and which will place the Company in an extremely strong position from now onwards.

Federation's Prospects

The year under review has been in many ways an anxious one, both here and in Africa. During its first five months, the average price of copper was between £179 and £180 per ton. One of the great new Copper Mines—Bancroft—then suspended its production for technical reasons; and our new financial year began with a strike in progress on the Copperbelt which lasted for 53 days and cost the Company in loss of royalty alone some £800,000.

However, since then the price of copper has improved and looks like becoming more stable; in a few days Bancroft will have resumed production, expansion at Nchanga and Mufulira is in progress and in general the economic and industrial scene in the Federation is brighter than before.

I have myself visited the Federation three times since our last Meeting, and I am making another visit in a few days' time, for about six weeks. I trust that by then, with the Territorial Elections in Northern Rhodesia over, we may look to a clearing of the political horizon in the Federation generally, so that the Constitutional discussions which are to take place in 1960 may have behind them a background of stability and of determination to make the Federal experiment, with its keystone of partnership, not only succeed but show the way to other Commonwealth Communities.

The year 1960 will be an important one for the Federation, not only because of the Constitutional discussions I have mentioned but because it will see the commissioning of the great Kariba Hydro-Electric Scheme, whose ultimate total installed capacity will run to something like 1,200,000 kilowatts of energy,

and whose mighty dynamos will be fed from a reservoir 175 miles in length and covering an area of 2,000 square miles.

We are proud that The British South Africa Company has contributed materially to this great project and the Federation is highly honoured by the news, recently published, that Her Majesty the Queen accompanied by Prince Philip, will visit the Federation next year and that Her Majesty may possibly include in the programme the opening of the Kariba Scheme.

The report and accounts were unanimously adopted and the final dividend of 3s. 3d. per unit or share, making 4s. 6d. per unit or share for the year was approved.

The retiring directors, Mr. Robert Annan and The Viscount Malvern, P.C., C.H., K.C.M.G., were re-elected and the other formal business was duly transacted.

Lord Malvern's Remarks

At the conclusion of the meeting, The Viscount Malvern, P.C., C.H., K.C.M.G., in addressing the members, said:—My Lords, ladies and gentlemen, it was suggested that you might, on this occasion, be interested in hearing a little bit about the country in which you have so many investments and which you founded in view of certain upheavals that are taking place in part of that country.

Well, the most interesting thing to me, having just come over here, is to find what a terrible thing it is supposed to be—and I had to come over here to find that out. On the spot, I would not like to say that nobody is worried. We all regret the violence that has had to be used and certain casualties, but one of the outstanding impressions I must say I have derived from certain groups in this country is that they are very disappointed that there are no European casualties yet.

Well, now, that sort of thing is not uncommon. Instead of saying "well, at any rate there is a first-class administration out there in all three territories and at the Federal centre, because they seem to have handled this matter extremely successfully," they would be happier if the policy of partnership had been implemented more by a few European deaths.

Well, now, this trouble will not last very long. I regret I made rather an optimistic statement in Northern Rhodesia a short time ago. When I was approached by the Press, I said I thought the whole thing would be over in three weeks, but something missed my memory at the moment—that this disorder has taken place towards the end of the rainy season, which means, in a country like Nyasaland, where there are few good roads, that communications, apart from road blocks, are very difficult. It is true they have used the Lake for taking the police up into the Northern Province. Another difficulty imposed by the seasonal outbreak is that the grass is about six or seven feet to eight feet high everywhere, and it is providing most excellent cover for the law-breakers. But, of course, had it happened in the middle of the winter, a few matches used with a favourable wind and all that cover would have disappeared in two or three days. I forgot that, and I think it will probably take another fortnight, possibly three weeks. I thought you would like to know because although the bulk of your business depends on exports out of the Federal area, you have a certain number of interests whose market is situated inside the Federation.

This disturbance is not going to cause any difference to the economy of the country at all. I do not know yet—and, of course, I am no longer in the Government, so probably I would not be able to tell you if I did know. Parliament is meeting, I think, in April and then we may get some more information as to what the actual cost of this disturbance is going to be. It may be that the movement of police and the various regiments we have in the Federal area may be absorbed by the ordinary budgetary provision. I think it is almost too much to believe that, but, anyhow, the amount extra might be such a size, that it may be carried forward.

I do not anticipate that the emergency is going to cause any particular increase in taxation.

Now, on the economic side in general, the Federal area—and it is one of the few functions of the Federal Government—has to control the economy. In the Federal area we had to have the usual credit squeeze which went round most of the Western countries, owing to business activity and price of primary products falling. Of course, as usual, it was extremely unpopular with the trading community because they never stopped to consider it was the very large amount of imports they had got in boom conditions that necessitated the credit squeeze at all.

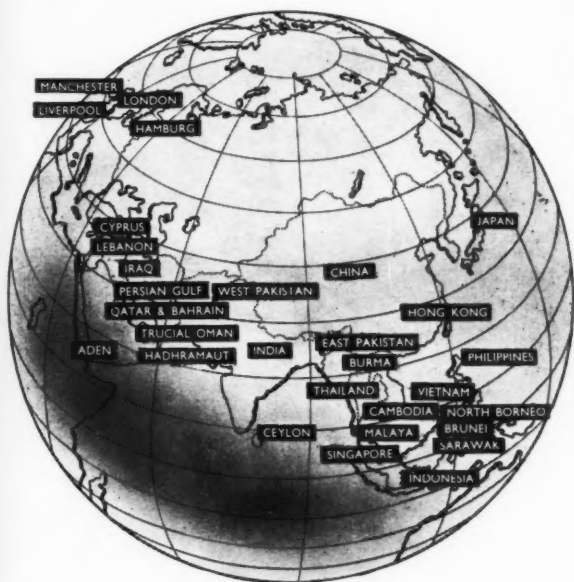
Now the credit squeeze is off; the economy of the area is absolutely first class, and there is nothing for any of the Members of the Company to worry about on that side of the business. Business has not rebounded very rapidly to the removal of the credit squeeze, but it is much healthier that these things should take a bit of time, and business will steadily improve, and I think in the middle of 1960 or towards the end of 1960, you will see a tremendous surge forward again in the development of that area.

In some ways it is quite fortunate that the disturbances have occurred now, because we are getting them over instead of having a much bigger one a little later on. In the same way, it is a good thing that the rather unhealthy boom that existed out there before ended because it would have resulted in a crash. It ended quite quietly; business is very steady, and I am very pleased, from my local information, to be able to tell members of the Company that the stability and economy of the area, in which you have so much money invested, is at the present time absolutely first class.

S.A. Rail Plan Abandoned

The Union of South Africa Government has abandoned plans to build a railway line from the Transvaal coalfields through the British Protectorate of Swaziland to the north coast of Zululand, and to develop a coal harbour at Sordwana Bay. Mr. B. J. Schoeman, Minister of Transport, said in his Railway Budget speech in the House of Assembly that prominent South African industrialists felt there was little prospect of an export market for coal. They said there was practically no demand for it in Britain or elsewhere. The provision of the harbour and railway line, at an estimated cost between £35,000,000 and £40,000,000 could, therefore, be justified. There could be no justification even for the railway line itself, which would operate at a considerable loss.

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KONONGO GOLD MINES

The twenty-fifth annual general meeting of Konongo Gold Mines, Ltd., was held on March 24 in London.

Mr. Robert Annan, M.I.M.M., Chairman, in the course of his speech, said:—After providing for depreciation at the usual rate, the net profit for the year to September 30, 1958, comes out at £111,458, which is £28,846 less than in the previous year. Out of this, an interim dividend of 2d. per share, costing £33,562, was paid in September, 1958, and your Directors now recommend the payment of a final dividend of 4d., costing £67,123, leaving £10,773 to be added to the unappropriated profits carried forward.

After deducting current liabilities, including future taxation and the final dividend, the surplus of current assets at the date of the Balance Sheet amounted to £69,721.

Coming now to operations at the mine, the tonnage treated increased by 8,480 tons to a total of 67,770 tons. Gold production amounted to 45,869 ounces, a reduction of 1,587 ounces. This represents a yield of 13.5 dwt., compared with 16.0 dwt. in the previous year. Of the tonnage milled during the year, 57,745 tons, or 85 per cent, came from ore-reserve blocks, the remainder from development and reclamation. At the year-end, the developed ore-reserves stood at 182,865 tons averaging 15.5 dwt., of which 27,675 tons averaging 17.0 dwt. were contained in pillars. This shows a decline of 6,545 tons, but an increase of 1.0 dwt. in value.

Development during the year was

directed mainly to delimiting known ore-shoots, notably the southern ore-body discovered on No. 10 Level Boabedroo. This work was still in progress at the year-end. Work was also continued on the mineralized zone in the hanging wall. Encouraging values were disclosed on the 5th, 6th and 7th Levels, Boabedroo, and in the start of sinking below the 17th Level.

Development during the first five months of the current financial year has given more satisfactory results, though still mainly confined to known ore-bodies. An interim calculation at January 31 shows a net gain of about 20,000 tons in reserves, with a small drop of 0.1 dwt. in grade. Most of the additional tonnage was developed in the No. 2 South ore-body, Boabedroo, where No. 5 Level had exposed a continuous length of 420 feet averaging 17.2 dwt. over 61 inches with the south end still in ore. No. 7 Level has to date a total of 190 feet of payable reef averaging 19.7 dwt. over a width of 46 inches. It may be, however, that both the Northern and Southern extremities have now been reached on this horizon.

The most encouraging exposure we have made since the year-end, indeed for some time, is that in the Footwall parallel Drive on No. 12 Level Boabedroo, where to date we have a continuous length of reef of 185 feet averaging 18.4 dwt. over 94 inches, with the North face still in good values. Nothing is yet known of this reef on either No. 11 Level or No. 13 Level.

We are keeping up exploratory development under careful geological control in the search for additional ore-bodies and our future depends to a large extent on the results of this work.

Coming Events

The Lord President of the Council (Lord Hailsham) will open the new Warren Spring Laboratory, D.S.I.R., at Stevenage, on Monday, June 29, 1959.

Sixteen papers on subjects of major importance to the plastics industry are to be presented at this year's International Plastics Convention, held in conjunction with the International Plastics Exhibition at Olympia from June 17 to 27, 1959.

The Twelfth Annual Conference of the Institution of Plant Engineers is to be held from May 6 to 8 at the Old Swan Hotel, Harrogate.

A conference organized jointly by the Institution of Production Engineers, the Institution of Engineering Inspection, and the British Productivity Council on the theme, "Quality in Industry," will be held at the Palace Hotel, Buxton, on June 18 and 19.

The Iron and Steel Institute will be holding its annual general meeting, 1959, on May 6 and 7, at Church House, Westminster, London, S.W.1.

Australia has been selected as the venue for the next plenary meeting of the World Power Conference with the theme, "The Changing Pattern of Power". This event will be held at the University of Melbourne in October, 1962, and up to 1,000 delegates from all parts of the world are expected to attend. The Secretariat of the Australian National Committee of the world body is at 45 Little Lonsdale Street, Melbourne.

Book Reviews

Second Symposium on Coal Preparation. Published by the Department of Mining, University of Leeds. pp. 513 with indices and illustrations. Distributed by the Secretaries, Coal Preparation Plant Association, P.O. Box 121, 301 Glossop Road, Sheffield 10, from whom copies may be obtained at 20s. post free.

The first symposium on coal preparation was held at Leeds University in 1952, and in view of its success and of the changes and advances that had taken place in the intervening five years, it was decided in 1957 that a second symposium be held. This accordingly took place at the same venue on October 21 to 25, 1957. The volume under notice presents all papers, discussions and notes relating thereto.

The subjects covered deal comprehensively with general preparation practices, washing, flotation, and sampling, as well as all other features of this aspect of the coal mining industry. A most interesting publication.

Papers and Discussions, 1956-1957. Association of Mine Managers of South Africa. Published by the Transvaal and Orange Free State Chamber of Mines. pp. 755 with illustrations, charts and indices.

This collection of the papers presented to the Association of Mine Managers of South Africa during 1956-57 offers a most comprehensive selection of mining reading. Subjects include discussions on shafts, pillars, development, ground control, exploitation, haulage, underground fires, mechanization, ventilation, drilling, and such items as budgeting, African feeding, and the like. A good cross-section of the enlightened thinking within the South African mining industry for that year.

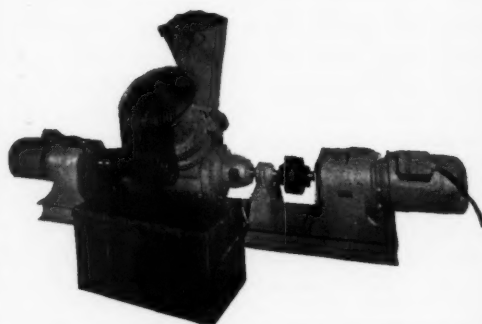
Handbook of the Petroleum Industry. Advisory Editor, G. Sell. Published by George Newnes Ltd. pp. 213 with illustrations and index.

This book provides a background of information for persons considering a career in the oil industry and provides much information on many facets of the industry.

Many well-known personalities of the petroleum industry have contributed sections to the book, so that the information contained is presented as modern and authoritative.

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